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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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610TH MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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THURSDAY

DECEMBER 5, 2013

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ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 8:30 a.m., J. Sam Armijo, Chairman, presiding.

COMMITTEE MEMBERS:

J. SAM ARMIJO, Chairman

JOHN W. STETKAR, Vice Chairman

HAROLD B. RAY, Member-at-Large

RONALD G. BALLINGER, Member

SANJOY BANERJEE, Member

DENNIS C. BLEY, Member

CHARLES H. BROWN, JR. Member

MICHAEL L. CORRADINI, Member

DANA A. POWERS, Member

JOY REMPE, Member

PETER RICCARDELLA, Member

MICHAEL T. RYAN, Member

STEPHEN P. SCHULTZ, Member

GORDON R. SKILLMAN, Member

DESIGNATED FEDERAL OFFICIALS:

KATHY J. WEAVER

GIRIJA S. SHUKLA

ALSO PRESENT:

EDWIN M. HACKETT, Executive Director, ACRS
PERRY BUCKBERG, NRO
PHYLLIS CLARK, NRO
JOHN CONLY, Luminant
TODD EVANS, Luminant
ANTONIO FERNANDEZ, UniStar
MARK FINLEY, UniStar
STEPHEN MONARQUE, NRO
DAVID NOLD, NRO
SHANKAR RAO, Bechtel
RUTH REYES, NRO
MUSTAFA SAMAD, Bechtel
JOHN SEGALA, NRO
RYAN SPRENGEL, MNES
REBECCA STEINMAN, MNES
MIKE TAKACS, NRO
ERIN WISLER, MNES

*Present via telephone

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P R O C E E D I N G S

8:30 a.m.

CHAIRMAN ARMIJO: Good morning. The meeting will now come to order. This is the second day of the 610th Meeting of the Advisory Committee on Reactor Safeguards.

During today's meeting, the Committee will consider the following. First, selected chapters of the Safety Evaluation Report with open items associated with the Calvert Cliffs, Unit 3, Combined Operating License Application referencing the U.S. Evolutionary Power Reactor. Two, Topical Reports and selected chapters of the Safety Evaluation Reports with open items associated with the U.S. Advanced Pressurized Water Reactor design certification and the Comanche Peak Combined License Application (COLA). Three, future ACRS activities and report of the findings of the Procedures Subcommittee. Fourth, reconciliation of ACRS comments and recommendations. And, fifth, preparation of ACRS reports.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Mrs. Kathy Weaver is the Designed Federal Official for the initial portion of

the meeting.

We have received no written comments or request to make oral statements from members of the public regarding today's sessions.

There will be a phone bridge line. To preclude interruption of the meeting, the phone will be placed in a listen-in mode during the presentations and Committee discussion. We also have another phone bridge line for the Calvert Cliffs Combined License presentation with participants from Pacific Northwest National Laboratory supporting the NRC Staff, and we ask that this line remain in a mute status unless these participants are speaking.

A transcript of portions of the meeting is being kept and it is requested that speakers use one of the microphones, identify themselves and speak with sufficient clarity and volume so that they can be readily heard. Another reminder is if you have cell phone please turn them off. And at this point, I'd like to turn it over to Dr. Dana Powers who will lead us through our Calvert Cliffs discussion.

MEMBER POWERS: Well, you've given us an excellent introduction. We are, indeed, doing the Reference COLA for the US-EPR design which is

Calvert Cliffs, Unit 3.

I remind everyone that the strategy we've adopted will be as design certifications in the reference COLA is they're being done in parallel and the staff brings to us a Safety Evaluation Report with open items.

When they do this, when the staff and the application feel that despite the open items there on a pathway to resolution of these issues, and I have to say that that's the reason this is successful approach and we can do things piecemeal. And I compliment both the staff and the application that they have been scrupulous in following that criterion that they be on a pathway to resolution.

We are going today to discuss a few chapters. They are the remaining chapters in the reference COLA, and once we complete these chapters then we will be able to move from Phase 3 to Phase 4 of the analysis. And at Phase 4 is where the staff and the applicant try to resolve the issues.

The reference COLA will come back to us and its associated SER in Phase 5 or prior to the final licensing determination. Today we're going to look at Section 2.4 of Chapter 2, the site characteristics. That section deals with hydrologic

engineering. We're also look at Section 2.5, geology, seismology, and geotechnical engineering. This will give the applicant a chance to show off what is truthfully a very beautiful site.

We will also look at Chapter 3, design of structures, components, equipment, and systems. We will not be looking at Section 3.7, seismic design. We will look at Chapter 9, auxiliary systems, Chapter 13, conduct of operations, Chapter 14, verification programs. Needless to say, we're going to be covering a lot of material here and, consequently, it's going to be at a fairly high level. And I have, indeed, asked particularly the applicant to provide us some background on both the site and the proposed plant design to remind all Members of where we are with this particular application.

Our Subcommittee for the US-EPR has examined these chapters and the open items identified by the staff and found no additional items. So, that tells you that we are -- we think this is in pretty good shape, and welcome comments from the rest of the Committee.

During the US-EPR Subcommittee Members opening statements, they want to make inquiry on

this. Seeing none, what I have asked is that the staff begin with kind of an overview of the entire effort, and then we will turn to the applicant who will give us some of the nitty gritty here.

Mike, are you in position to give that overview?

MR. TAKACS: I am certainly ready for that. Thank you, Dr. Powers.

Good morning, Committee Members. My name is Mike Takacs. I am the lead Project Manager for the Bell Bend COLA application. I am also the backup Project Manager for the Calvert review. Unfortunately, Surinder Arora is out sick today. I will --

MEMBER POWERS: I love the idea of the gypsies much better.

(Laughter.)

MR. TAKACS: I will be providing that presentation following the UniStar presentation. The point, and to reiterate what Dr. Powers mentioned earlier, this is a major milestone. It will complete the Phase 3 review for the Calvert so that we may move on to Phase 4.

With that, as I mentioned, I'll be providing some of the open items that remain that

were presented to the Subcommittee over the course of the year. We've had three Subcommittee meetings to support this Full Committee meeting for 2013.

And with that, I will turn it over to Mark Finley from UniStar. He is the CEO of UniStar, and I will relieve myself of this seat to allow -- the laptop operator.

MR. FINLEY: Thank you, Mike. As Mike said, I am Mark Finley, CEO/President, Chief Nuclear Officer of UniStar. Appreciate the opportunity to be here this morning and move forward to close Phase 3. I want to thank Dr. Powers for moving forward with the Subcommittee and putting us in a good position for today's meeting. And, as well, thank John Segala, Mike Takacs, and Surinder Arora, in particular, as Project Managers for moving the staff forward in the reviews, again, to get us ready for today's meeting.

A little bit about my background. I've been with UniStar seven years, before that with Constellation Energy for about 23 years, mostly at the Calvert Cliffs 1 and 2 site, which is the same site, basically, for Calvert 3. Before that, Nuclear Navy.

We can move forward on the slides. I

have support for my presentation today, and I'll ask my team before you speak to introduce yourselves, a series of individuals who have been key in doing some of the work on the chapters that we have in our scope today. I won't go down name by name.

I do have quite a few slides today. And more in the nature of overview, as Dr. Powers said, in getting some feedback from Dr. Powers we selected some of the more interesting topics to talk about for the Calvert Cliffs 3 project. Some of them may be open items, some are not open items, but they are significant in terms of the work done for the Calvert 3 project, so that's why we talk about them today. Next slide, John.

So, a number of open items, and this is actually based on the draft SERs that we had roughly a month ago, this number has changed quite a bit, gone down quite a bit based on what you'll see from the staff presentation later this morning. That's a good thing.

The point I wanted to make on this slide is the only one of these 93 open items have we not responded to. All the others we've responded to, and as Dr. Powers said, for all those that we've responded to and for the one that we haven't

responded to we're on a good track to provide a response.

MEMBER POWERS: That really is the key to this work. I mean it's a piecemeal examination at this stage, and if we weren't on a pathway to a resolution this wouldn't work at all. And you guys really have done -- you and the staff have done a heroic job of being disciplined in bringing to us stuff only when you're on a pathway.

MR. FINLEY: Thank you. By way of introduction, Slide 4 just, as I'm sure you know, so UniStar is responsible for design and operation of the Calvert Cliffs 3 project, but we do have contracts with Areva and Bechtel to provide the good portion of technical support in terms of the work supporting the FSAR.

We use the incorporate by reference methodology in terms of the US-EPR FSAR. Of course, the chapters that we're going to talk about today is the third set of chapters. We've been before you twice before back in April of 2012, and then back in April of 2011. It seems like only yesterday. And we won't discuss any of the generic information in the US-EPR FSAR. We'll just be talking about site-specific and supplemental type information.

Here's just artist rendition of the site. It shows the existing units just left of center in that picture. The artist rendition there is just to the right, and upper right-hand corner. You see the site for the Calvert Unit 3 EPR, and it's real hard to tell from this angle, but that's up on the bluff, and we'll talk more about elevations later in the presentation, but that plateau, if you will, away from the bay is about 85 feet above sea level. You can see one area of graded land down on the shoreline of the bay, and we'll talk more about that. That's where the intake structure is that provides makeup to the ultimate heat sink after 72 hours. So, we'll talk a little bit more about that.

And then just geographically see a street map here, more or less, of Southern Maryland, site located in Calvert County, and Washington, D.C. just inside the 50-mile radius. Okay, John.

Here, again, is the list of 2.4, hydrologic engineering, and move quickly to Slide 9. I'll give you just a little overview of the hydrological characteristics, and as you saw already from the map, the site is located on a peninsula between the Chesapeake Bay and the Patuxent River.

The main body of water where we receive our intake makeup which has been our makeup for UHS, and have concerns about tsunami and hurricane-type flooding is the Chesapeake Bay. We'll talk some more about that, obviously.

The Patuxent River is to the west of the site, and there are drainage streams that run from the site westward toward the Patuxent River. And these are non-tidal streams, so they don't have a significant concern in terms of flooding. Slide 10, again, as I mentioned, the main physical separation, if you will, for the structures on site is we have the power block with all the generic structures described in the US-EPR FSAR up at the 85-foot grade approximately, and then one site-specific structure, ultimate heat sink makeup water intake structure located about 10-foot grade on the shoreline of the bay. And Slide 11 just shows maybe a closer up picture of the peninsula. To the right is the Chesapeake Bay, and then lower left is the Patuxent River.

Slide 12 shows the streams that I mentioned. You see lower lefthand corner of the main diagram there, Johns Creeks. That's the main tributary of the Patuxent River that flows from east

to west, and we've done flooding analysis on these streams using the maximum assumed precipitation for one hour. And even assuming that the culvert that goes under Highway 2-4 there is blocked and floods the upstream portion of those streams, and the water still stays well below the power block grade.

Slide 13, wanted to talk a little bit about the maximum storm surge from the hurricane it is for the Calvert Cliffs site. Some of the main bullets here in terms of the analysis that was done, we did use the SLOSH code, Sea Lake Overland Surges from Hurricanes code, to analyze the surge in the bay, maximized the storm in accordance with regulatory guidance, and chose a very conservative track for the storm through many sensitivity studies that were done to see what the worst track for the storm was. Essentially, the storm is nearly Category 5 when it hits the shoreline moving east to west, and that maximizes the surge when it hits the shoreline.

The location where it hits the shoreline is just below the mouth of the Chesapeake Bay down by Norfolk, Virginia. That causes the maximum surge into the Chesapeake Bay. The storm then moves inland and makes a right-hand turn, if you will, to move up

the western shore of the Chesapeake Bay, and that maximizes the surge as it moves north through the bay. So, all those things we think very conservative in terms of maximizing the surge level at the bay. And we see the numbers here, prediction using the SLOSH code with a 20 percent uncertainty is around 17.6 feet just taking the surge without the waves, and when you add the wave height plus runup of the waves on the structure, that's another 15.6 feet with a total of about 33.2 feet with wave runup on the structure. And I'll show you Slide 14 actually is a good pictorial looking from the side. So, with that 17.6 surge you remember I mentioned that the grade elevation of the makeup water intake structure is roughly 10 feet, the 17.6-foot surge gives you a 7.6-foot water depth above that grade, so that actually cuts down some on the size of the waves that can propagate in that depth of water. So, we calculate that new wave height and then the wave runup on the ultimate heat sink structure.

I've got a side view of the ultimate heat sink structure on Slide 15 which shows that the upper right-hand corner of this slide you can see that the elevation of the ventilation intake for the safety systems in the structure at 36.6 feet, so

roughly 3-foot of margin based on this conservative analysis with wave runup of the hurricane.

That's really what I wanted to say about that. Let me ask if there are any questions.

MEMBER BANERJEE: What wave breaking, if you get liquid thrown higher, would it affect these systems?

MR. FINLEY: Let me aks Mustafa.

DR. SAMAD: The wave sections --

MEMBER POWERS: You need to use a microphone, and give us your name beforehand so that we can attribute --

DR. SAMAD: I'm Mustafa Samad from Bechtel, and I'm just proxy here for one of our colleagues, Jemie Dababneh.

The wave impact on the structures in terms of breaking waves hitting the structure, that force would be accounted for in the design of the structure itself. So, the maximum forces coming from the wave breaking, hitting the structure and breaking would be typically the maximum force that a wave can attribute to a structure. And when you design the structure design on this intake system it would account for that breaking wave impact.

MEMBER BANERJEE: My question was really

regarding breaking waves throwing liquid higher than the level, and getting into some of the intake structures and things like that. Would that have an affect?

MR. FINLEY: Maybe I'll ask Shankar.

MR. RAO: My name is Shankar Rao, Bechtel. I wanted to point out that the inlet to these openings have louvers which are provided in such a way that any water that gets splashed in, similar to like rain, it protects it from not draining inside the building but allowing it to drain outside.

MEMBER BANERJEE: But there's a certain amount of liquid it can handle. Right?

MR. RAO: Oh, yes. It's going to be --

MEMBER BANERJEE: I mean, this is not rain. It's going to be breaking waves.

MR. RAO: Right. It's more of the amount of water that's not expected to be like full force of water coming up and flooding in, and flowing into it. It's more of splashing the droplets and other kinds of things that could potentially be coming onto the --

MEMBER BANERJEE: Remember the wind is pretty high at this point so, I mean, you've got a

curler coming in, and what's going in. But you are saying that there is protection for this in terms of being able to handle a certain water capacity.

MR. RAO: And, in addition, we do have tornado dampers which we can -- knowing that this type of incident could occur can be closed.

MEMBER BANERJEE: Okay.

MR. RAO: And that will provide additional isolation, because this particular system is not --

MEMBER BANERJEE: That's an operator action?

MR. RAO: That could be an operator action.

MEMBER BANERJEE: Is it at the moment?

MR. FINLEY: It's not a required -- it's not an operator action that we credit in the analysis. I was going to mention that if you look at the configuration, there is a concrete wall that sits right in front of the intake here so that is somewhat of a tortuous path. And the wave runup analysis should address the maximum height of the solid water.

MEMBER BANERJEE: Right.

MR. FINLEY: So, it really should only be

splash, as you say, splash that goes above that height.

MEMBER BANERJEE: Okay. I think you've answered the question. You can, if needed, shut it off, if needed.

MEMBER BLEY: How persistent can these surges be? How long can the water be there? Can you get flooding up from the bottom or from any drain paths?

MR. FINLEY: So, I don't know, is Jamie on from Rizzo. Okay?

VICE CHAIRMAN STETKAR: By the way, the other members who weren't in the Subcommittee meeting, just use your cursor. It's hard to see, and if you don't read the material -- show the other Members with the cursor where grade elevation is, and where the elevation of -- what level of water we're actually talking about relative to the equipment in this building. It'll give you a little different perspective. That's grade.

MR. FINLEY: Right.

VICE CHAIRMAN STETKAR: And what's the maximum wave runup?

MR. FINLEY: So, the maximum wave runup is 33.2, so --

VICE CHAIRMAN STETKAR: All right. Put your cursor up there. It's well above any of the equipment rooms, so the questions about water getting in are really relevant from the bottom, and from the top, and from the sides.

MR. FINLEY: Yes. So maybe, Shankar, you could speak to the design of the internal structure.

MR. RAO: Anything that is -- we have, as you may notice here, we have the pump room over there which has the equipment associated with the operation of the pump, including electrical equipment which is in the room.

This room is hydraulically sealed from bottom, any penetrations coming in from the bottom, and from the sides. And we do have access only at the top, and the two other accesses that are below are all provided with the hydraulically sealed doors.

MEMBER BLEY: Are there pipes that run through that room, or are they external?

MR. RAO: Yes.

MEMBER BLEY: What if one of those breaks and it's hydraulically sealed? Would it flood? So, if you've got a pipe break or a flange leak you can flood that room, I would think, if it's really

sealed.

MR. FINLEY: Right. So, there's -- these rooms are -- there's actually four divisions.

MEMBER BLEY: So you drop one.

MR. FINLEY: Right. Each separated from the other from a flooding perspective.

MEMBER BLEY: So, it would flood but it would be one room.

MR. FINLEY: Right, one room.

MEMBER BLEY: Okay.

MR. FINLEY: Other questions on the hurricane?

MEMBER BANERJEE: Just a question for interest. Post-Fukushima, did you make any changes to this design, or was it already taking everything into account?

MR. FINLEY: So, we had some other actions unrelated to Fukushima running in parallel that actually drove some changes in design which helped in terms of responding to Fukushima. With respect to the hurricane, the analysis wasn't changed after Fukushima. Our analysis was using the up-to-date methodology and was acceptable in terms of a Fukushima response.

We did upgrade the design in response to

staff questions that actually came before the Fukushima requirements, but this upgraded design did help respond to the hurricane event.

MR. FINLEY: And you didn't have to change anything after Sandy either with regard to the storm surges?

MR. FINLEY: No. In fact, there was discussion at the Subcommittee meeting about Sandy, so Sandy is a much smaller storm, in fact, than what was analyzed for us. And we did look a little bit at the data for the Chesapeake Bay and Annapolis, in particular, for Hurricane Sandy. The water level during Sandy in Annapolis didn't reach the top five flooding storms that we kind of used as input previously for Annapolis station. So, of course, Sandy had a much bigger effect on northern cities, but I think the main point is our analytical storm was quite a bit stronger than Sandy, and the path that we assume that it takes is much worse in terms of surge and wind.

MEMBER BANERJEE: So, you could have predicted what happened in New York.

MR. FINLEY: I'll let the experts speak to that. I couldn't.

Okay, if no other questions, we'll move

to tsunami on Slide 16. So, tsunami is really not a significant concern for the Calvert Cliffs site, but we wanted to show you that we did do analysis with respect to an underwater landslide off the Continental Shelf which could produce the largest tsunami for the Chesapeake Bay. What the analysis showed is that with that tsunami and with the worst case initial water level, we come up to a water level of around 11-1/2 feet at the site, so that's much lower, of course, than the 33.2 feet that we talked about for the hurricane. So, the driver in terms of the design for this intake structure is, obviously, the hurricane and not the tsunami.

Okay. One other topic for Section 2.4 is groundwater. This is not an open item, but -- not an open item with respect to the pH of the groundwater, I should say. So, we have some acidic groundwater at the site, about 5.2 pH. This is considered aggressive in terms of concrete by the regulatory guidance. So, we have taken measures to waterproof those foundations which would enter the watertable where this low pH water is located. We'll be monitoring behind that waterproof boundary. We'll have the capability to de-water behind the waterproof boundary, so we will keep any of this

potentially aggressive groundwater away from the concrete structure.

This groundwater is not acidic at the Chesapeake Bay, so the ultimate heat sink makeup water intake structure actually has more of the concern of the brackish water of the bay to deal with. And we'll address that through the recipe, if you will, of the concrete that we use for the makeup water intake structure.

Slide 18 shows a pictorial of the waterproofing system, so you'll see we'll have some sand below the foundation, and then this waterproof membrane that provides the seal, if you will, for the watertable. And we'll have, like I said, de-watering capability behind that membrane to make sure we keep away the acidic water.

And let's move to Slide 19. So, that's it for Section 2.4. I'm not going to repeat the bullets there. We don't have any departures or exemptions in this section from the US-EPR FSAR.

Moving right on to Section 2.5, geology, seismology, and geotechnical. I'm going to introduce Antonio here in just a second, but I do want to mention before we start that we were one of the first projects to incorporate the Central and

Eastern U.S. seismic library into our seismic analysis, so we made that updated seismic library a part of our seismic analysis for the plant. Section 2.5, obviously, talks about the ground motion that's the result of that analysis. Section 3.7 is actually still open. We'll talk about Chapter 3 here in a minute, but 3.7 is not actually a part of that discussion, so seismic analysis of all the structures is still under review as it is in the design certification.

Let me introduce Antonio. He's worked on the civil structural part of the work for UniStar for several years now. Antonio.

DR. FERNANDEZ: Thank you, Mark. I'm Antonio Fernandez for UniStar. So, as you are all well aware, Section 2.5 is quite extensive, so now we're going to touch on the key elements, and the key topics that impact the development of these sections the most, and the most interest.

Like Mark was saying, we were, of course, grouped to incorporate the 2012 Central and Eastern United States seismic source model, and all this happened in the middle of the development of the application, so we have to shift gears back, incorporate the seismic source model before heading

into structural reconciliation.

That's one of the two things that impacted the development of this work. A second one was you'll also probably remember the occurrence of the Mineral, Virginia earthquake in the Central Virginia seismic zone which happened in August of 2011.

This earthquake was also -- well, if anybody was here, anybody would have felt it. It was a strong motion, and the question that it brought up immediately to the table was, well, was this event properly incorporated into the seismic source model that came out just before -- that was under development before this earthquake happened. So, UniStar has performed the analysis, and has performed the necessary work to confirm that the Epri-DOE-NRC seismic source model of 2012 adequately incorporates this event. And that, therefore, that source model can be used to develop a reliable seismic design basis which was the main objective of our work.

I'm here on Slide 22. This is still being tracked as an open item since the staff is currently performing a comparatory analysis.

Moving to Slide 23, you've also seen the

ground motion response spectra of the Calvert Cliffs Unit 3, which is shown here in the blue curve, and that blue curve corresponds to the motion that was developed after the incorporation of the 2012 seismic source model.

It's compared here against the red curve which corresponds to the 1986 EPRI source model, so you can see that there's an increase, obviously, in the seismic design basis that resulted from the update of the seismic source model.

CHAIRMAN ARMIJO: You're putting papers there.

DR. FERNANDEZ: Last time it happens.

(Simultaneous speech.)

CHAIRMAN ARMIJO: As long as we've interrupted you here --

DR. FERNANDEZ: Sure.

CHAIRMAN ARMIJO: -- just slide it to the side if it's bothering you.

MEMBER-AT-LARGE RAY: Any vision of something still under review relative to the inclusion of this event in the model, say some more about that, please.

DR. FERNANDEZ: Sure. UniStar has completed the work to confirm that this event is

adequately incorporated into the seismic source model. UniStar has completed, obviously, the probabilistic seismic hazard assessment. One of the RAIs, RAI-385 which is mentioned there in the slide, it's still tracked by the staff as an open item. As we understand, the staff is performing a confirmatory analysis of the seismic -- of the calculation of the seismic design basis.

MEMBER-AT-LARGE RAY: On a PSHA curve, probabilistic seismic hazard curve where would this event fall from a recurrence interval?

DR. FERNANDEZ: Well, we would have to get into the details of the recurrence of the central --

MEMBER-AT-LARGE RAY: Yes, I know.

DR. FERNANDEZ: We need a seismic zone.

MEMBER-AT-LARGE RAY: It's not easy.

DR. FERNANDEZ: Which would have to get into the calculation the seismic source model. But I can comment --

MEMBER-AT-LARGE RAY: Is that a very rare, extremely rare event or what?

DR. FERNANDEZ: Well, I can comment on that a little bit. Right. The magnitude of the event which is recorded as 5.8, if we look at the Central

Virginia Seismic Zone, the maximum magnitude distribution that was used for that zone, the lower end of that maximum magnitude is higher than the Mineral earthquake. So, from a magnitude perspective, from a magnitude point of view, all the probabilities of an earthquake happening from that zone indicate that we considered in the analysis to respond to a higher magnitude. So, the whole distribution of magnitude is to the -- let's say it's to the right, the seismic Virginia earthquake is adequately incorporated.

Then the other part of your question which is occurrence, will come -- did this event alter the assumptions of recurrence that we have for the Central Seismic, Virginia Seismic Zone. UniStar has evaluated and has concluded that the existing recurrence interval parameters that are in the seismic source model adequately incorporate this event. Then there's the tracking of an open item that the staff still has to complete.

MEMBER-AT-LARGE RAY: Okay, but I -- you're looking at it from the standpoint that this is something that isn't outside of what's anticipated by the model.

DR. FERNANDEZ: Right, right. It's not

outside.

MEMBER-AT-LARGE RAY: Okay.

DR. FERNANDEZ: So, I'm going to move along to Slide 24, also a slide that has been shown. This is not the ground motion response spectra that we're showing in the blue line for the Calvert Cliffs project. It's the safe shutdown earthquake which is higher than the ground motion response spectra. It has a peak ground acceleration of .15 gs versus the .12 of the GMRS, so there's margin built in in the seismic design basis of the project.

Peak follows a broadband spectra curve as it is shown from the 2 hertz on. On the lower frequency, it is controlled by the new PSHA calculation with the Central and Eastern United States source model. And in the low frequency, we see that there is an exceedance to the generic certified seismic design response spectra.

So, that takes us to one of the -- moving ahead to the next slide, if anybody has any questions here, takes us to some of the denatures that we are going to have to consider, and this seismic design response spectra is one of them.

So, one of the departures we're going to talk about some of them right at this point, in

particular, it's the low strain shear wave velocity. The US-EPR specifies a minimum shear wave velocity of 1,000 feet per second for the foundation of Safety Category 1 buildings. And at Calvert Cliffs, some of the foundation backfills have lower shear wave velocity than 1,000 feet per second, so how -- this is reconciled by doing a site-specific soil structure interaction analysis. The soil has -- the properties that the soil has sometimes -- we don't change them, so the analysis incorporates exactly the shear wave velocity of the backfill at the site.

A second departure is the safe shutdown earthquake that you just saw. It has an exceedance in the low frequencies approximately below .3 hertz, and these departures also reconcile by performing a site-specific structural analysis, soil structure interaction analysis that uses the site-specific Calvert Cliffs Unit 3 safe shutdown earthquake.

MEMBER RICCARDELLA: Excuse me. Just going to the previous slide 24.

DR. FERNANDEZ: Yes, sure.

MEMBER RICCARDELLA: You showed two response spectra.

DR. FERNANDEZ: Yes.

MEMBER RICCARDELLA: The safe shutdown

earthquake and then the dashed curve. Which are you actually designed to, the dashed curve --

DR. FERNANDEZ: Okay, the design of the US-EPR is designed to the dashed curve.

MEMBER RICCARDELLA: Okay.

DR. FERNANDEZ: To the higher ground motion.

MEMBER RICCARDELLA: Right.

DR. FERNANDEZ: And for the site-specific structural reconciliation, we performed an analysis with the blue curve to confirm that that design is also adequate for the blue curve.

MEMBER RICCARDELLA: Okay. Thank you.

DR. FERNANDEZ: Because we have that exceedance.

Okay. The third departure in Slide 26, the soil properties. Like I was saying, some soil properties are beyond the bounds of what was considered in the certified design analysis. Soil is very site-specific. It's practically impossible that a generic design incorporates all the possibilities and combination of soils that can be there, so issues such as unit weight of backfill, shear wave velocity, distribution, some coefficients of frictions, they're very site-specific and these are

also being reconciled by performing the site-specific analysis using these properties. So, there's no cutting corners.

Fourth departure has to do with settlement. There's COL items in the US-EPR that specify what levels of sediment are acceptable. One of them has to do with tilt or rotation of the foundation, and US-EPR specifies a maximum tilt of half an inch per 50-feet of length in a foundation. For the ESWB and EPGB, this estimate of tilt is higher than the one-inch -- than half inch in 50 feet, which is very, very strict, by the way. It's a very strict limitation. So, it's slightly higher and further evaluations have been performed to verify that the structural -- to verify the structural integrity of the foundation. And analysis indicates that the design of the foundation adequately deal with the slight excessive tilt.

So, those are departures. One other -- as I said, we're going to touch on the key elements and key topics of Section 2.5. One of them is settlement and tilt. This is a soil site so, therefore, settlement is of particular interest. Slide 27, this design center has performed extensive analysis in settlement beyond the -- I would say

beyond the common practice. We have developed detailed models to estimate settlement, accounting for construction process, accounting for interaction between buildings and the -- also the effects of de-watering, the effects of excavation, and the results are shown -- of that analysis are shown in the next slide, Slide 28.

This slide shows the evolution, let's call it, the evolution of settlement through time through construction. We have concluded that the settlement's mostly elastic so it will happen on an immediate basis as the plant is being constructed, as loads are being incorporated into the soil. And the important thing about this result and this slide is that we observed an asymptotic behavior as we approach the end of construction, and as we get into the initial stages of operation of the plant. So, we have concluded that settlement pretty much is over once construction is finished. So, that pretty concludes --

MR. FINLEY: So, just to summarize. Thank you --

DR. FERNANDEZ: Do you want to summarize?

MR. FINLEY: Yes, maybe. Thank you, Antonio. So, you see the summary here for Section

2.5. I think actually the number of open items will be updated by the staff here later this morning. It's down to four, I think, so that's good.

Okay. Moving on, for Chapter 3 really we thought maybe a little bit of discussion on 3.8 would be worthwhile. And just to remind, what I said earlier, Section 3.7 is not part of the meeting today. That's a scope that will be moved forward into Phase 4, but it's not been addressed yet in terms of the Subcommittee or the staff.

MEMBER SKILLMAN: Mark, before you go on, I'd like to go back to Slide 28, please.

MR. FINLEY: 28.

MEMBER SKILLMAN: As you explained the settlement becomes asymptotic, in other words, the longer you proceed in the construction the more the entire site settles. It raises in my mind a question, what about two different buildings that may be settling at different rates, that have interconnected conduits or piping, such that one building sinks three inches and the other eight, and now you have shear forces or bending moments on critical piping or conduit. How is that addressed?

DR. FERNANDEZ: Correct. It actually happens -- you're right, there's -- settlement takes

place at different rates for different buildings, and different buildings have different loads. So, yes, the -- one building finishes its settlement while the other is still going, so in the COLA documentation through RAI responses there's settlement monitoring programs and settlement management programs that specify that connection points between buildings s should be performed, once this monitoring indicates that it is safe to do so. And at the end of the -- so, the connection of this piping and these elements between buildings will be delayed to later stages when it is safe to do so.

MEMBER SKILLMAN: Thank you. How is that controlled in your construction process? Is that part of a site-wide battle plan for constructing such that individuals know you don't make those connections until the settlement analysis has been -- or the settlement data has been -- has confirmed that the buildings are where they're supposed --

MR. FINLEY: Yes, I would comment and, Shankar, you can chime in, too. But this will be controlled procedurally. And, in fact, we're working now with the staff on ITAAC related to monitoring of settlement. And procedurally we'll be required to monitor settlement, make sure it's within the design

criteria that we've analyzed. And using that design criteria, that will be what's built into the piping connection design. So, if the monitoring program shows we're out of the design criteria we had previous set, then we would stop and redesign or re-analyze for those connections.

MR. RAO: Any differential movement between the building that has been predicted over time will also be incorporated into the design of the piping system, that is to provide proper flexibility in piping design and/or flexible joins in the conduits, what you call it as the concrete conduits.

MEMBER SKILLMAN: Thank you. Thank you.

MR. FINLEY: Okay. So, move again to Section 3.8. We thought it would be worthwhile talking a little bit about the one significant, I would say, site-specific safety structure which is the ultimate heat sink makeup structure. All of the other safety structures except for the duct banks and the buried pipe, of course, are described in the US-EPR FSAR, and I think as we said earlier, we will be using the design of these structures for the Calvert -- that are described in the US-EPR FSAR, that those designs will be used at the Calvert

Cliffs site for those generic structures. But the one site-specific structure is the ultimate heat sink makeup water intake structure, and this is the structure located on the shoreline of the bay.

Slide 32 just lists some of the bullets. It is a combined structure with the makeup -- the structure for makeup to the main circ water system, as well as the ultimate heat sink system, so it's a combined structure. There is a diagram on Slide 33 that shows the structure, both structures with the forebay in the center. Now, the main circulating water makeup structure is on the upper lefthand side of this figure. That is a Category 2 structure, so we verified that during a seismic event it won't affect the Category 1 structure which would be the forebay and the ultimate heat sink makeup structure which is on the right-hand side of this diagram.

And as we said earlier, you can see looking at the ultimate heat sink makeup intake structure that's it four divisions there. It's, obviously, a four safety train plant, so each of those divisions is independent and would provide makeup to its assigned UHS basin.

That's really all I had for Chapter 3. I will mention in the summary slide 34 that we are

down to 10 open items when I saw the staff slides that you'll see here in a moment so that's, again, good news closing out these open items. No departures or exemptions in this section.

Moving on to Chapter 9, we thought it worthwhile to talk about Section 9.2, specifically the ultimate heat sink which is, to some extent, site-specific at Calvert Cliffs. The makeup system is site-specific. Normally, we provide freshwater makeup to the ultimate heat sink basins for normal operations. However, as we talked about in an emergency, we provide makeup from the Chesapeake Bay through the safety-related structure that we just talked about.

We provide each train at least 300 gallons per minute makeup. We have the capability to provide over 500 gallons per minute makeup with each of the pumps so there is quite a bit of margin there. And this makeup is adequate to keep our UHS basins above minimum levels after 72 hours into an event.

Slide 37, there is one departure related to our makeup system and that is related to this keep-fill piping. The keep-fill piping is just a section of piping that provides flow from the

essential service water pumps back into this makeup piping to make sure we keep that pipe full of water to avoid any water hammer type events. But that's not a section of piping or a function that's described in the US-EPR FSAR, so it is considered a departure.

Slide 38, talking about evaporation and drifts, so it turns out that in the US-EPR FSAR there is an analysis of evaporation and drift. And, in fact, it uses the same temperature data from the Calvert Cliffs Unit 3 site, so the temperature data for Calvert Cliffs Unit 3 site is identical to that used in the FSAR, so it was an easy problem for us, if you will, to confirm that we had adequate water in the basin, and that our makeup flow of 300 gpm was adequate.

Slide 39, we spent some significant amount of time looking at the issue of interference of the cooling tower plumes, UHS cooling tower plumes both recirculation on itself, and also on the safety-related HVAC air intakes. This was a COL item from the US-EPR FSAR.

Slide 39 shows a high-level summary of that analysis. Essentially, the peak wet bulb temperature, zero percent exceedance wet bulb

temperature for the site is 85.3 degrees, and we calculated a recirculation type interference from the cooling tower plume of less than 2.5 degrees, so we combined the 85.3 and the 2.5 and showed through that process, through the 24-hour transient process that the 95 degree design temperature for essential service water is not exceeded even considering that recirculation effect on the UHS cooling towers.

MEMBER SKILLMAN: Has that ever been a problem at Calvert Cliffs 1 and 2?

MR. FINLEY: Calvert Cliffs 1 and 2 are once-through cooling site. They don't have -- there is no cooling tower ultimate heat sink.

MEMBER SKILLMAN: Okay, thank you.

MR. FINLEY: And, similarly, on Slide 40 we summarize the results of the evaluation associated with interference of these cooling tower plumes on the safety-related HVAC intakes. And, again, we did a computational fluid dynamics analysis of this plume and showed that the interference at the closest of the safety-related intakes is less than 2.5 degrees, and we showed that we have margin in these ventilation systems to accommodate that kind of an increase due to the plume.

And that's really all I had for Chapter 9. On Slide 41 is the summary, and I think we're down to one open item for Chapter 9. It does relate to this computational fluid dynamic analysis of the plume.

We're left with Chapter 13 and 14, and not a lot that's unique, I would say, for the Calvert Cliffs Unit 3 project for these chapters. We are committed to developing a training program for the recent industry guidance. On Slide 43 there you see NEI 06-13A. That will be the guidance used for our training program. And we're committed to developing our non-licensed and reactor operator training programs at least 18 months prior to delivery of fuel on site.

In fact, there's a little time line we show here that relates to both development of the training program and the staffing plan on Slide 44. You can see six years prior to commercial operation we begin our hiring and training program, and we'll have our first operator license class, and non-licensed operator classes conducted well before we load fuel on site.

Emergency planning is the next section, 13.3. We have provided a comprehensive emergency

plan. We updated that recently to incorporate aspects of the revised emergency plan rule to incorporate the hostile action requirements. We've also done a staffing analysis to the extent that we can without having the detailed procedures done at this point in accordance with NEI 10-05. I think the emergency plan, the revised emergency plan that we recently submitted is still under review by the staff. And on Slide 47 shows the number of open items, and these open items are, in general, related to that emergency plan which is still under review.

And then the last chapter, Chapter 14, talk a little bit about Section 14.3, an ITAAC. Again, nothing really stands out in terms of unique for Calvert Cliffs. We do have a significant number of ITAAC right now in the US-EPR FSAR. There are 1,275 ITAAC, and then specifically for the COLA we have an additional 246, so somewhere north of 1,500 ITAAC will be -- 1,521 ITAAC. You see the number there, will be conducted for the project, which actually brings us to the close.

On Slide 50, this large number of open items associated with Chapter 14 has gone down to two from what I saw on the staff's slide, so most of the reviews are completed now for Chapter 14 which

is, again, good.

Brings us to the end of the content of our presentation. Slide 52, we talked about the seven departures and four associated exemptions which we think are well justified. As I mentioned earlier, we've responded to all but one of the remaining open items, and we're on a good path to provide a response to that last remaining open item.

And I think the last bullet there talks about all the chapters, except for Chapter 1, which doesn't require ACRS review. And we'll proceed into Phase 4. Again, Chapter 3.7 has not been covered in Phase 3, but will be covered in Phase 4. Any other questions for me or my team?

MEMBER POWERS: I think you've got it, Mark. Very nice, very nice.

We'll turn now to the staff.

MR. FINLEY: Thank you very much.

MEMBER POWERS: Thank you.

MR. TAKACS: Okay, good morning, everybody. My name is Mike Takacs. I will be presenting the presentation for the staff. Surinder Arora, as I mentioned, is not in today.

A little background on myself. Prior to —-- I've been at NRO for five years. Prior to that,

I started out my career as a Navy nuke operator aboard the USS Enterprise. I only mention that because Dr. Bley was aboard that ship before my time.

(Simultaneous speech.)

MEMBER BLEY: Coming from this little guy over here.

MR. TAKACS: Following that, I was a plant operator at the Shoreham Nuclear Plant. We did low-power testing. Following that, I was a nuclear reactor operator at Brookhaven National Lab at the Heavy Water Moderated Reactor, and the Medical Research Test Reactor. And all of those reactors I've ever helped operate are permanently shut down, so --

(Laughter.)

MR. TAKACS: Now I'm in NRO, so --

MEMBER POWERS: And we're --

(Simultaneous speech.)

MR. TAKACS: We're trying. Okay. Let's go ahead and go to the next slide. With me is Phyllis Clark. She's the Project Manager to support the project she's volunteered to help run these slides for me.

MEMBER POWERS: I'd like to see how that

volunteer --

MR. TAKACS: For the first slide, we got the chronology here. This is a slide that was presented to previous Full Committee meeting, and I've updated the slide in red font. Since the last Full Committee meeting back in April 2012, we've received Rev 9 of the DCD. And the major milestone on there, this last red font bullet, on November 6th we had the Subcommittee meeting on the remaining two sections of Phase 2, 2.4 and Chapter 9. Okay.

The next slide is the review schedule. Now, red font showing, again, just reiterating that October 9th was the milestone for the staff here completing Phase 2 of the SEs. Phase 3, today is the major step in completing Phase 3 for us, as is pointed out in there.

The one thing I want to point out on this slide is that you see Phase 4, 5, and 6. The schedule is still under review. That has to do with developing the review schedule for the design cert. That's still work in progress, so as we get that schedule for the design cert, we'll have worked out a schedule for the Calvert review, as well. The next slide.

Okay. The -- what I'm going to do is --

MEMBER POWERS: Make sure you haven't run into scheduling problems with the ACRS meetings. That's a question.

MR. TAKACS: Well, I haven't been involved in that. I've only been in this group for two months.

MEMBER POWERS: But nothing gets flagged.

MR. TAKACS: Not to my knowledge.

MEMBER POWERS: As far as I know, scheduling here is when you guys call us.

MR. TAKACS: Yes, that's my understanding.

MR. SEGALA: This is John Segala, the Chief of the EPR Licensing Branch. We have not had any problems scheduling ACRS meetings, and there's been no impacts on our schedule due to that.

MEMBER POWERS: Okay, I just wanted to make sure.

MR. SEGALA: Okay.

MEMBER POWERS: I didn't want to be on your critical path.

MR. TAKACS: Okay. For the first table here, what I want to mention before moving on, I've utilized tables to show both the -- well, the current status of open items. And I'll highlight

what has changed in red font. What I'm also going to do is I'm going to show what the Subcommittee was presented as far as the actual RAIs. There are new RAIs that are very recent. And I may touch on them just very briefly, but the Subcommittee has not seen those, or they're in a preliminary stage where they're OGC review, the applicant's draft, and what have you, so that's how we'll proceed forward.

For the 2.4 section, that was just recently presented to the Subcommittee in November. The level of effort for this was 1,400 hours to get to this stage. There were, basically, two open items presented, and you can go ahead to the next slide. And I'm just pointing out what the Subcommittee was presented with. These still -- one of them has been responded to, and I don't recall which one. I know it was presented, mentioned at the UniStar presentation.

The first one has to do with the diagram. Different figures are not equivalent. And the second one had to do with the groundwater subsidence, where it levels off, is that the bounding condition. So, I'm just reiterating what the Subcommittee questions were presented to. Okay, any questions on that?

Okay. Moving on 2.5. Now, 2.5 is geological, seismology, and geotechnical. The level of effort for this was 7,400 hours, and rightly so, it seems. This was presented to the Subcommittee back in May, and you'll see that I have the red font showing that the first one, 2.5.1 had originally five open items. Since then, four are now confirmatory, and one has been resolved closed.

The total -- I should step back. The total RAIs issued was at the time 133. The new number is 135. The total of open items back to the Subcommittee was listed as eight. We're down to four, but there's a caveat here. For 2.5.2, those two RAIs are still open, and I'll explain why in the next slide. And Section 2.5.4, there are new RAIs being issued to the Calvert -- to UniStar, actually, one of them dealing with -- it's a follow-up RAI to Section 2.5.4 dealing with a new ITAAC that needs to include some settlement control issue. And the second, which is in the draft form right now to the applicant is having to do with revised information in the DCD, value for dynamic bearing capacity. That information has been revised in the DCD, so this new RAI questions that applicability to the COLA COL. The Subcommittee has not seen these two questions

yet. I just bring them up as a point.

Okay, the next slide. These two questions are the ones remaining that the Subcommittee did see back in May, and the first one having to do with the hazard seismic contributions, individual seismic sources, and the second one having to do with staff requesting information on sensitivity studies related to the earthquake back in 2011, the Mineral, Virginia earthquake. Okay, so those are still under current review.

Chapter 3. Chapter 3 is a very busy slide shot. What I'll do is -- as you can see, the red font indicates the total changes in RAIs. The red -- the total 132 previous was 125 RAIs. I know Mark Finley has mentioned from UniStar that the current number of open items that he was given was 10. That was a presentation I had to update, and I apologize. I found out later in the game that we have four that are in that process of the preliminary stages of OGC review, draft, that have not been formally sent to the applicant, so I wanted to make that clear. What I'm using this table for is so that we see what actual open items will be, or are currently in this project.

So, looking at Section 3.2, it

originally had one RAI, open RAI. It's down to zero. 3.4 had one, it's down to zero. The Section 3.7, as you heard, was put into the Phase 4 review. It was not reviewed under the Phase 2 review.

Section 3.8, now here's the big one. 3.8 had originally 23 open items presented back in January, now January almost a year ago, so it has dropped down, the number on here as seven, five of those being previous RAIs, two of those are actually new RAIs, as well. And you'll see that in the next slide when I get there.

The Section 3.8 has 15 -- excuse me, 3.9 has 15 now. It originally had -- excuse me, I'm jumping ahead. Section 3.9 had six RAIs, now it shows 15. We had six original open items in there, and we're now —-- we have closed those and we have two RAIs now, open items, that have not been presented to the Subcommittee.

Section 3.11 and 3.12 also have new -- where originally 3.11 had one old RAI. That was closed out, that open item, and a new one is now being in the process of being issued. And 3.12 had none, and now it has a new one in process, if you will.

And one thing I failed to mention, the

total hours that were needed to do this review were 3,000 hours to complete. Okay. And go ahead and go to the next slide.

So, as I mentioned, what I wanted to do is just indicate what the RAI questions were to the Subcommittee. These three questions related to Section 3.5, missile protection, have to do with the turbine generator. The reason the three of these are still open is that we had -- the staff had to resolve issues related to the DCD, and that was recently resolved. So, now they're working at looking at resolving these three questions, so this is in process right now. They are currently still open, though.

The next slide, and there'll be a separate one. These will show the five open items that remain -- that were presented to the Subcommittee back in January. Obviously, they're self-explanatory but here the description of sliding analysis for the SCI-1 structures, the makeup water intake structure east wall issue, that's still an open item here.

MEMBER BLEY: Mike, do you have responses on these that you're still reviewing? Is that the status?

MR. TAKACS: From what the staff told me, they do have -- they are reviewing responses on these. And the third one on here talks -- the request on here was the forces -- seismic load forces as far as are they conservative in the COLA versus the EPR bounding values.

And the second slide is just the remainder of this 3.9 Category 1 structure RAIs. The first one, soil pressure considerations for the common basemat intake structure. And the second one here, which is actually the fifth one from the Subcommittee, is the settlement of the essential service water building. And I just want to verify with the reviewer that we did get these responses, and are reviewing them right now. And I think the reviewer -- is the reviewer here today? Yes, I apologize. We're reviewing these responses right now.

Okay, so those items were the ones provided to the Subcommittee. Okay. The next section, Chapter 9. Chapter 9 was also recently presented to the Subcommittee this past November. We originally presented four open items, and at that presentation two of those were actually mentioned that they would be confirmatory, Section 9.4.

The one open item that remains in 9.2, if you go to the next presentation slide, is having to do with the CFD computer analysis for the ultimate heat sink essential service water cooling tower. And that's still being reviewed. We have the response the staff is reviewing. I believe the staff has possibly additional questions on that analytical work.

One thing, I apologize, I failed to mention, for this review for Chapter 9, it was 1,100 hours to get to this stage. Okay, next slide.

Okay. Chapter 13. Chapter 13, the level of effort here to get to this point was 1,200 hours. This was presented to the Subcommittee back in May. The total number originally was 178 questions. We had --the only section that had open items at the time was the emergency planning. They were originally six open items. We've closed out five, and one is unresolved closed.

These eight are, essentially -- one is a follow-up RAI, and seven are RAIs that none of these have been processed yet. The majority have to do with the emergency plan, Rev 8, the recent submittal. There's some information that is missing or was not included, so these -- most of those

involve getting that accurate information in Rev 8 of the emergency plan. And, again, I need to mention that they are not formally processed yet. Okay, next slide.

Chapter 14, for the level of effort here we had 2,300 hours to get to this point. This was presented in January. You can see on the slide here, there's been some changes to 14.2, 14.3.1, 14.3.3. And if you go the last slide, we originally had 146 questions issued. That number remained the same. The original open items to the Subcommittee was originally eight, and we're down to two. And what I'll do is I'll explain. For 14.2 -- back up the previous, 14.2, those three original open item RAIs, two are resolved closed now and one is confirmatory. For 14.3.1, those have been completely closed, the two that were in there. 14.3.2 and 14.3.3, you can go ahead and go to the last slide, one more.

These are the two open items RAIs that remain in Chapter 14 having to do with ITAAC, Seismic Category 1 structures, and the following one is ITAAC, as well, design, fabrication, and installation. So, these were presented to the Committee back in January, a year previous to today. And the last slide, of course, a good part of the

presentation to be at.

MR. SEGALA: This is John Segala, again. I'm the EPR Licensing Branch Chief. I just want to add that any -- we issued the SERs with open items. We presented those open items to the Subcommittee. Any new RAIs that were issued after we made the presentation to the Subcommittee will be reviewed, brought to resolution. We'll issue the SER with no open items, and then in Phase 5 we'll come back to the Subcommittee, and we'll go through each one of those and describe how we got to resolution on those.

MEMBER POWERS: The only requirement is that you come to the Subcommittee on a path to resolution. We don't expect that there will be additional questions. One of the things that we are always interested in, of course, is when the staff has done independent analyses, and I know there's a few of them flagged here and there that I could identify. And it was useful to get the number of hours to -- of effort that was taken here.

You have a blank screen, so I assume you're done.

MR. TAKACS: Unless there's questions for staff --

MEMBER POWERS: Do any of the members have questions that they would like to pose on this? No questions. Okay. Well, I think the upshot is that we think we're on a good pathway from our perspective to move to Phase 5 once you guys have completed your Phase 4, so we'll anticipate that when it gets appropriately scheduled. There are frictions here because this is being done in parallel with the DCD review of the design itself, and so there's some interaction back and forth. And I think we saw that in the presentation. But other than that, Mr. Chairman, I'll turn it over to you. I think we're in a position to -- this will, by the way, complete Phase 3 for the Calvert Cliffs Unit 3.

CHAIRMAN ARMIJO: Well, thank you, Dana. Well ahead of schedule, so first of all I'd like to thank the presenters. I was -- attended the Subcommittee meeting, and that's why I was so quiet through this meeting. It was very well done.

What we're going to do is we're going to recess until 10:45 and we'll start with the US-APWR briefing.

(Whereupon, the proceedings went off the record at 9:49:03 a.m., and went back on the record at 10:45:35 a.m.)

CHAIRMAN ARMIJO: We're reconvening for the next session. The topic will be the Comanche Peak -- I'm sorry, the US-APR design certification and Comanche Peak reference combined license application. And John Stetkar will lead us through this. John.

VICE CHAIRMAN STETKAR: Thank you, Mr. Chairman. We have a lot of material to cover here, and to orient the Committee Members regarding the scope of what we'll be hearing about from MHI for the US-APWR design certification, we'll be hearing presentations on Chapter 6 and Chapter 7 of the design certification document and related material on long-term cooling and GSI-191. Those are basically covered under Chapter 6.

We'll be writing an interim letter on those chapters. We're in that phase of the review cycle. We'll also be hearing from them on the Advanced Accumulator, and we'll be writing a final letter to finalize our review of that particular topic. So, there's a separate topical report that the staff has written their final SER on the Advanced Accumulator. So, that has an issue of finality as far as the Committee is concerned, only the Advanced Accumulator.

From Luminant we'll be hearing about Chapter 2, not all of Chapter 2, five sections of Chapter 2 and Chapter 6 and Chapter 7 from the COL. That is also an interim status letter on those chapters. So, if you could follow all of that, that's what we'll be hearing from. Because there's a lot of material to cover, I don't want to take up a lot of time with introductory material. I'll turn to the staff. Do you have anything? Nothing at all? If not, Ryan, it's your's.

MR. SPRENGEL: Thank you very much. Good morning, I'm Ryan Sprengel with MNES representing MHI for the areas that were mentioned for 6 and 7, and various associated areas including the Accumulator Topical Report. Also with me, Rebecca Steinman for Chapter 6 and associated areas, and Erin Wisler for Chapter 7. They'll be discussing those specific areas.

Previous meetings here, this list is growing which is definitely a positive, and we'll hopefully expand that even further after today's meeting. Back in 2011, `12, and `13 many different areas and topics covered, and we're also looking for some additional interactions with the Subcommittee early next year.

Upcoming submittals, these will be touched on in the relevant areas, but there's a couple of key submittals that will be coming in for the staff's review tied to Chapter 6 and 7 there. And then also, the LOCA reports, as of today they'll have both been submitted. And those are actually supporting some of the items with the accumulator review, and those will be done today. And the staff will have those to confirm those minor revisions associated with some items in the Accumulator review.

Down at the bottom we also would like to acknowledge some changes in our activities going forward. We submitted a letter, and we've had interactions with the staff since that letter, and will continue interactions with the staff. We are undertaking a coordinated slowdown of our activities starting basically early part of 2014, and carrying into the future where MHI will be focusing resources on the Japanese plant restart activities in Japan.

I do want to stress that we will maintain activities, just at a different pace. That includes both the NRC review activities, as well as our ACRS interactions. And now I will turn it over to Rebecca Steinman for Chapter 6.

MS. STEINMAN: All right, hello. For those of you that are on the Subcommittee, you will probably maybe finally, maybe not remember that we spent two days discussing activities associated with Chapter 6 in September, and then had a third day discussing long-term core cooling and GSI-191 in the beginning of October. And I'm going to briefly go over some of the things that have happened since those two meetings, and what the remaining items we have to work on in those areas.

The first slide up here is related to DCD Chapter 6. When the staff wrote the SE, they identified 12 open items in the SE, three of those were closed before we even got to the Subcommittee to talk to you guys, and nine of them were discussed in detail with the Subcommittee members.

Since the time that we had that meeting back on September 17th, we have been working actively with the staff to close out many of those open items, and there are three items listed here which were at the time this presentation was created a week ago, were all open items that we were working on with the staff. In the last week, we have managed to close some of these, as well. Those items are the sparger associated with the emergency letdown

system, and hydrodynamic loading associated with that. Design impacts changes on the mass and energy release analysis, and the secondary piping system rupture. That was RAI 923 with the area under the containment analyses in 6.2.1. We discussed several of those areas when we were with the Subcommittee, and the mass and energy release is one of the areas that we're still working on.

We just recently in the last week had some discussions with the staff in relation to some of the ACRS feedback and activities that we had been doing with the staff, and have come to a path to what we believe will close out this item. NMHI will be revising an RAI response to deal with the additional information needed to close out the technical concerns for that. And we anticipate to submit that design change by the end of this, or not -- it's not a design change. It's not a design change, I misspoke. Let me take that back.

We will submit that RAI describing the additional supplemental information to hopefully close that technical issue here very soon. And then we also at the time of the meeting back in September had actions that were required in Chapter 15 in relation to the Accumulator, and implementing the

scaling biases that were associated with that in the Chapter 15 LOCA analyses.

And as Ryan just mentioned a few minutes ago, that required changes to both the small break and large break LOCA Topical Reports, which discuss how those biases are treated. And those reports were just recently submitted to the staff yesterday and today, so the staff will have an opportunity to review those. You know, we talked with the staff prior to submitting those, and we believe that what we did will completely close out the remaining issues associated with that implementation in Chapter 15. But, of course, the staff has to have time to actually review what we have done.

VICE CHAIRMAN STETKAR: Did you -- and we haven't seen that, but did you basically apply the biases that the staff was recommending in --

MS. STEINMAN: Yes, we did.

VICE CHAIRMAN STETKAR: Okay, thanks.

MS. STEINMAN: The other open items that we had were primarily related to confirmatory types of actions associated with DCD Rev 4. At the time of the meeting, DCD Rev 4 had just been submitted and the staff hadn't had an opportunity look at that material. They have been working a lot in the last

several weeks, and more than half of the confirmatory items and most of the open items have already been closed out, and they're working actively to try to continue to close out. So, I don't expect any additional technical issues to arise from those closeouts because it really was a confirmatory type of activity. But, like I said, that's still an ongoing effort for the staff to finish up.

But from MIH's perspective we believe that we have addressed all of those hydrodynamic loading at this point, and there may be additional work associated with that. And then, of course, we owe the staff the response that we are working on for the mass and energy release.

We also left the September meeting with the ACRS with a couple of action items. NMHI is working to respond to those action items this month, maybe even as soon as the end of this week, first part of next week those responses will be submitted. There are six items of discussion associated with that.

We have no additional RAIs that are outstanding right now, no new or follow-up RAIs that were issued between the last meeting with the

Subcommittee and this meeting here. But, as Ryan mentioned, we are supplying a revision to MUAP-07031 which is our sub-compartment analysis document, and that will be submitted this month. All right. Next slide please. Thank you, Ryan.

We did have a meeting with the Subcommittee on October 1st, as well. That was this long-term core cooling. At that time, there were a couple of different open items that we talked about. One of the ones that at that time was remaining as an outstanding issue that we had not determined a closure path with the staff with the Tier 2* designation of the latent debris amounts.

Since that meeting, we have talked with the staff about that. We have submitted a revised RAI response and DCD markups to designate those items as Tier 2* material, and I believe that the technical aspects of this closed out, as well.

From the October meeting, we also had action items from the Subcommittee. There were 12 items in this case, and we recognize that there was a possibility of additional need to discuss with the Subcommittee in this particular topic area, but we are intending a written response to those 12 action items. They will be submitted this month, as well,

but not in the next day or two. Chapter 12, or Chapter 6's items are almost finished and in the finalization process. We're still working on getting appropriate answers for all of these. There are currently no outstanding RAIs for this area, either. Next slide please.

MR. SPRENGEL: Now, we do recognize that for long-term cooling in GSI-191, as mentioned, is kind of mid status right now, and this will be an area that we would --

VICE CHAIRMAN STETKAR: That's right. We will, eventually, write a separate letter to close out those issues, but not at this time. We'll give you interim feedback on the issues of long-term core cooling and related GSI-191, hopefully at this meeting, if we can get the letter out. But that is an interim letter, that will not be a final letter regarding that topic.

MS. STEINMAN: And then the final topic that I want to discuss and associated with Chapter 6 was the Advanced Accumulator Topical Report. That was the second day of our Chapter 6 meeting back in September on the 18th.

The staff has issued the public version of the Advanced TRSE back in November. That,

basically, just took into consideration proprietary information and things along those lines. And as we discussed earlier, one of the actions that NMHI at that time was to revise the LOCA topical reports to reflect how we were going to handle the Accumulator scaling biases. And as Chairman Stetkar had asked us, we did accept —-- you're not the Chair.

VICE CHAIRMAN STETKAR: It's okay, it's fine.

MS. STEINMAN: I realize that, sorry. So, as we've previously discussed, we did accept the staff's bias values and implement those into the topical reports.

VICE CHAIRMAN STETKAR: Remind me, Rebecca, I know the small break LOCA is -- they're both topical reports. Right?

MS. STEINMAN: They are both topical reports.

VICE CHAIRMAN STETKAR: So, the staff will have to redo their SERs, and we'll have to see those.

MS. STEINMAN: Well, I don't want to speak for the staff, but I believe that they're going to do a supplemental SER --

VICE CHAIRMAN STETKAR: Okay.

MS. STEINMAN: -- to address the revision. But if that's not correct, the staff should speak up.

VICE CHAIRMAN STETKAR: We'll straighten that out.

MS. STEINMAN: Okay.

VICE CHAIRMAN STETKAR: Thanks.

MS. STEINMAN: At this point, I'd like to turn it over to Erin Wisler, who will provide an overview of Chapter 7 activities.

MR. WISLER: Okay. So, this past April, the Chapter 7 Subcommittee meeting was held resulting in 14 questions --

VICE CHAIRMAN STETKAR: Erin, just make sure you speak up a little bit so that we pick you up on the microphone.

MR. WISLER: All right. I apologize.

VICE CHAIRMAN STETKAR: And don't hit it with your paper because, otherwise --

MR. WISLER: I'll try not to.

VICE CHAIRMAN STETKAR: -- we castigate you.

MR. WISLER: So, this past April, the Chapter 7 Subcommittee meeting was held resulting in 14 questions requiring MIH responses. Subsequent

discussions were held with the staff to insure a common understanding of the outstanding issues. Mitsubishi submitted responses to the ACRS questions this past September, and committed changes have been made to most documents. Some changes to documents are still outstanding.

RAI responses to SE open items regarding PCMS failure, D3 coping analysis assumptions, and selection of PAM variables among others have been submitted and are under staff review. Currently, there are no RAIs requiring MHI response.

MR. SPRENGEL: That concludes our portion of the presentation.

VICE CHAIRMAN STETKAR: Any questions from any of the Members from MHI?

MEMBER SKILLMAN: Yes, please. I have a question on your Slide 3, design change impact on mass and energy release.

MS. STEINMAN: Yes?

MEMBER SKILLMAN: May I ask you to please give just a brief description of what the design change is and how this is being handled in configuration control space for the unit?

MS. STEINMAN: All right. As part of our GSI-191 process, we made some changes to the flow

paths associated with that, and it was done and implemented in DCD Rev 4. And there were some questions from the staff regarding we had made -- submitted an RAI response. It was asking, basically, whether or not that design change impacted any of the containment analysis responses.

We did sensitivity studies and various calculations to show that what had been done previously in DCD Rev 3 with respect to the containment analyses was bounding, and why we believe that, and showed some additional graphs and things like that. And the mass and energy is one area where the staff still had an outstanding question, so this is not a new design change. It was something that was implemented as part of DCD Rev 4 in association with GSI-191 from the perspective of the flow path of water.

MEMBER SKILLMAN: Thank you. Thank you, John.

VICE CHAIRMAN STETKAR: Anything else? If not, that was efficient. I appreciate your compiling everything into one place. And if there are no further questions for MHI -- Charlie?

MEMBER BROWN: Well, I just wanted to -- we did receive on the I&C, we received the

responses to the questions, and we have reviewed some of those. So, we're looking that there will be some follow-up at some point and we'll try to address what areas --

VICE CHAIRMAN STETKAR: That's part of where we are in this --

MEMBER BROWN: Yes, I just wanted to make sure we had --

(Simultaneous speech.)

MEMBER BROWN: -- that you submitted them, we got them. We've actually read some of them, gone through them, so expecting follow-up.

VICE CHAIRMAN STETKAR: Great. We'll have the staff come up then on the DCD, change seating arrangements here.

(Off the record comments.)

MR. BUCKBERG: Good morning. My name is Perry Buckberg. I'm the lead Project Manager for the review of the design certification for the US-APR. I'll be presenting Chapter 6 and 7 of the Phase 2 Safety Evaluation Reports, the Advanced Accumulator Topical Report, and dedicating a little time to GSI-191 and long-term core cooling.

VICE CHAIRMAN STETKAR: Be careful about the microphone up there with your paper.

MR. BUCKBERG: Oh, yes, I've got you. Just a little review of the status of our project to date. This is the current public schedule. As Ryan briefed on, there's going to be some changes coming through and the public schedule may be updated within the next few hours, the next couple of days, if not. And anything with a date on it in the right column will be TBD at this point, and we'll be working with MHI at a slower pace waiting to ramp back up when things are ready to go, but it's indeterminate at this point when that's going to happen.

At this point, the staff has issued Safety Evaluation Reports with open items for the Chapters listed, most of the chapters. And all those chapters, except for Chapter 3 has been through the Full Committee, as well. And today we're presenting 6 and 7, so they'll be added to the list.

The staff has also issued seven US-APR topical reports. Is this a typo in here? Chapter 6 of the Safety Evaluation Report was presented on September 17th, 2013. I won't read the slide but the following open items were discussed in some detail on this page and the next. And there were no staff actions resulting from the Chapter 6 meeting. Any

questions on Chapter 6?

MEMBER SKILLMAN: What was the open item on the refrigerant leak, please? What is the refrigerant, and what is the issue?

MR. BUCKBERG: I'll ask the staff to answer that question.

MR. NOLD: David Nold with the Containment Ventilation Branch.

VICE CHAIRMAN STETKAR: A little louder.

MR. NOLD: Oh, David Nold with Containment Ventilation Branch. The issue with the refrigerant leak on containment chillers in the plant had to do with the fact that there was concern on my part that this refrigerant contains a certain amount of oil, and when it escapes rapidly from the system it depressurizes, goes into a gas. That's the driving force.

CHAIRMAN ARMIJO: What is the refrigerant, please?

MR. NOLD: It's going to be variable -- it can still vary from plant to plant. It's 134A is what Comanche Peak was planning on using.

CHAIRMAN ARMIJO: Okay. So, your concern is aerosolization of the oil?

MR. NOLD: Of the oil and the freon as it

escapes from the system in a massive system leak.

CHAIRMAN ARMIJO: Okay. And that's the question that's being addressed now?

MR. NOLD: Yes.

CHAIRMAN ARMIJO: Thank you. Okay.

MEMBER CORRADINI: The concern, just so I understand, the concern is just effect on the operating -- I don't -- it's a health issue, I assume.

MR. NOLD: It's a health issue for those workers in the area. It's a containment issue, well, not containment per se, but containment, the fact that you can try to control it escaping from the refrigerating rooms to other areas of the plant, and ventilate as quickly as possible and get it out of the plant.

MR. BUCKBERG: Any more questions? Well, after the Subcommittee brief on Chapter 6, we followed with a brief on the Advanced Accumulator Topical Report, MUAP-07001. The staff went into detail following MHI's presentation, and there were no staff action items resulting from that meeting.

VICE CHAIRMAN STETKAR: Could you, Perry, because the Advanced Accumulator -- I hate to put you on the spot, but I'm sure you have someone here

that can answer. The Advanced Accumulator on this design is one of the probably more interesting pieces of hardware in the entire plant, and we heard from MHI that they are redoing their LOCA analyses as a result of scaling biases that the staff has requested that they include. Could you give the rest of the Committee a little bit of background about why that exercise is being done? We have quite a bit of time here, so the notion about what is the genesis of this scaling bias, and why is there a concern that the analyses need to be redone?

MR. BUCKBERG: The staff will reply.

MR. SCHMIDT: This is Jeff Schmidt from Reactor Systems, just a brief overview. We used a -- most of the change in the scaling bias is due kind of to the tool that we used. We used CFD to determine the -- the Japanese had done a half-scale, full-height half-radius test, so there was some question of how to handle the scaling to a full-size accumulator. And we addressed that, what we call the scaling bias, by using CFD. And we used CFD to come up with what we thought the bias was and the uncertainty associated with that is. So, the staff felt that something should be applied for that, where originally there was nothing applied for the

fact that it was somewhat of a half-scale test.

MEMBER CORRADINI: I don't understand, I'm sorry. So, the bias, essentially -- so what are you trying to hold constant in the design -- let me -- I don't want to get into too much detail, but what is staff concerned about relative to the scaling? Is it that the time scale -- you want to preserve the time scale, or consciously reduce the time scale by the distortion?

MR. SCHMIDT: Well, there was some concern in the design there's this vortex chamber that you go from large flow to small flow, and there could be issues say with cavitation that flow regime change. And the cavitation could change the effect of flow rate that the accumulator would provide. So, since the -- in this case, the radius is half-scale, you know, we wanted to make sure that there wasn't something that could occur in the full-scale model that wasn't occurring in the half-scale model, so we used CFD to try to determine if we could see any type of phenomenon and what -- if there was any bias that may be due to that. For example, if we saw cavitation, should we be reducing the flow rate from the accumulator to account for that.

MEMBER CORRADINI: Okay, thank you.

MR. SCHMIDT: Any other questions?

MEMBER CORRADINI: Thanks, Jeff.

MR. BUCKBERG: Thanks, Jeff. Following the Chapter 6 in Advanced Accumulator meetings in September we had an October 1st meeting to discuss long-term core cooling between GSI-191, and I listed some of the topics covered in the staff presentation on this slide and the following slide, number 8.

Three open items specific to Chapter 6 were discussed, excuse me, from Chapter 6 that were specific to long-term core cooling were discussed in detail during the presentation, and there were no resulting staff actions.

MEMBER CORRADINI: But these remain open.

MR. BUCKBERG: The current status I don't know right off. It's very dynamic right now.

MEMBER CORRADINI: Okay, all right. I'm just looking at a colleague that supposedly is following you.

MR. BUCKBERG: There's no technical impasses. They just could be in process right now.

MEMBER CORRADINI: Okay, thank you.

MR. BUCKBERG: Do you want to address?

MS. REYES: I believe that all of the open items --

VICE CHAIRMAN STETKAR: Give your name so we know who you are.

MS. REYES: Oh, I'm sorry. This is Ruth Reyes. I'm the Chapter PM for Chapter 6. I believe that all the open items associated with GSI-191 are right now closed.

MEMBER CORRADINI: Okay, thank you.

MS. REYES: We only have probably some confirmatory items and maybe those are also closed.

MEMBER CORRADINI: Thank you.

MR. BUCKBERG: Thanks, Ruth. Any more questions on Chapter 6 related to issues? If not, I'll move on to Chapter 7.

Prior to my tenure as lead PM back in April, the staff and MHI presented Chapter 7 Safety Evaluation. There were several open items discussed in detail, as well, during this presentation. They're listed on Slides 9 and 10. And there were several action items, I believe the count was 14 to MHI, and the staff had two additional items that required updates of the Safety Evaluations. And MHI sent a response in in September, and the staff is currently working to polish up for the updates needed to be made in response to these staff actions. And that's all I have for Chapter 7. Any

questions for the staff?

VICE CHAIRMAN STETKAR: Any members have any questions for the staff, 6 and 7, accumulator, anything? If not, thanks a lot, Perry. Appreciate it.

MR. BUCKBERG: That's my presentation.

VICE CHAIRMAN STETKAR: We'll have Luminant come up and give us a presentation on Chapters 2, 6, and 7 for the site-specific issues in those chapters.

MR. MONARQUE: Bear with me. While Luminant is getting set up, Stephen, do you have any introductory statement you'd like to make?

MR. MONARQUE: Thank you, Mr. Stetkar. My name is Stephen Monarque. I'm the lead PM for the review of the Comanche Peak COL. And I want to thank the Full Committee for giving us the opportunity to present Chapter 2 without hydrology and geology, Chapters 6 and 7 for today's Full-Committee. And this is our third Full Committee presentation, and we've made substantial review progress over the last several years, so thank you.

(Off the record comments.)

VICE CHAIRMAN STETKAR: We're ready.

MR. EVANS: Good morning. I'm Todd Evans,

Engineering and Projects Manager for Luminant for Comanche Peak Unit 3 and 4 COL application. I'm here today with John Conly from licensing to present Sections 2.0 to 2.3, and Chapters 6 and 7 to the ACRS Full Committee. Don is available on the phone so if we have any questions or anything, he'll be available to chime in if we need it.

We appreciate this opportunity to discuss the Comanche Peak 3 and 4 COLA which references the Mitsubishi US-APWR. Today's presentation will be brief and will include an introduction, and then a list of topics that we noted that were discussed with the ACRS Subcommittee.

The Comanche Peak 3 and 4 COLA uses an incorporated by reference methodology. FSAR Chapters 2, 6, and 7 take no departures from the DCD for the US-APWR. There are no contentions pending before the ASLB. All confirmatory items have been incorporated into FSAR Rev 4 which we did get submitted just this past week, and that should be available soon, as I assume it'll still be in process, so that will be available for you soon.

Luminant has responded to all open items, and no outstanding issues are identified in

the Safety Evaluation Report.

Going into the chapters a little bit, the topics that were discussed at the ACRS Subcommittee meetings for these chapters included information on population data, some discussion about the airways around the Comanche Peak site, some discussions about the abilities to detect and respond to leaks in pipelines in the vicinity of the plant, chlorine detection for the main control rooms, some discussion about wind speeds, and then also about probable maximum precipitation. If you have any questions or follow-up on any of these, that's fine. Otherwise, we'll move to the next slide.

In Chapter 6, we also covered chlorine detectors, so the same subject that was discussed also in Chapter 2 for the main control room. And then there was a little bit of discussion about fiber and aluminum inside containment for Comanche Peak 3 and 4. And then for Chapter 7, one topic that was discussed was concerning the displays in the EOF, and being able to display information for all units simultaneously.

MEMBER SKILLMAN: All units, Todd, means all four units when you fully build both units, or

just the new ones?

MR. EVANS: All four units.

MEMBER SKILLMAN: All four.

MR. EVANS: So, each unit in the EOF will have its own separate display.

MEMBER SKILLMAN: Thank you.

MR. EVANS: And that is all that we had prepared to cover.

VICE CHAIRMAN STETKAR: Any of the members have any questions for Luminant? Most of this, by the way, is -- Chapters 6 and 7 is IBR.

MR. EVANS: That's correct.

VICE CHAIRMAN STETKAR: As you gathered the site-specific issues were primarily meteorological issues that we discussed for Chapter 2.

MR. EVANS: Correct.

VICE CHAIRMAN STETKAR: If nothing, that's pretty straightforward. Thank you very much.

MR. EVANS: Thank you very much.

VICE CHAIRMAN STETKAR: We'll have the staff come up.

MR. MONARQUE: I'll go ahead and email the slides right after my presentation. So, what I'll do is for the purpose of my presentation I'll

read from the slide. It's a short slide.

VICE CHAIRMAN STETKAR: Yes, just make sure when you do that, Stephen, just give us the slide number so in case there are any questions when you read from it so that we have it on the transcript.

MR. MONARQUE: Okay, Slide 2, please. Today's presentation is a summary of Chapters 2 partial, 6 and 7, Safety Evaluations with open items. The staff has issued Safety Evaluations with open items for Chapters 2, 6, and 7, and these Chapters were presented to the ACRS Subcommittee earlier this year. I should point out that Chapter 2 does not include hydrology and geology. That will be a separate corresponding separate meeting. Today's -- I won't go further about Chapter 2. And we didn't identify any significant issues for these chapters.

Slide 3, please. Chapter 2 partial includes geography, site safety, mill trade facilities, and transportation. Oh, thank you. Slide 3, please. Okay.

We presented this to the ACRS Subcommittee in April of 2013. There were no issues we identified. Slide 4, please. Thank you.

Chapter 6, engineered safety features.

Chapter 6 discusses the engineered safety features designed to reduce consequences of postulated accidents. We presented this to the Subcommittee in September of this year. There were no issues identification.

Slide 5, please. Chapter 7, instrumentation and controls. This is mostly IBR. We presented this to the Subcommittee in April of this year, and we did not identify any issues to present to the Full Committee. This concludes my presentation.

VICE CHAIRMAN STETKAR: Again, any members have any questions for the staff? If not, Stephen, thank you.

Well, what I'd like to do is ask if there are any public comments from anyone in the room? I don't know, Girija, do we have anyone on the bridge line?

MR. SHUKLA: No public, no.

VICE CHAIRMAN STETKAR: Are we sure

MR. SHUKLA: Yes.

VICE CHAIRMAN STETKAR: Okay. I need to ask for that. I'd like to thank MHI, and Luminant, and the staff for their presentations, and we will try to get the letters out during this meeting.

That's all I can -- I can't promise because we have a very difficult schedule for our meeting, but we'll work on it.

With that, Mr. Chairman, I turn it back to you a little early.

CHAIRMAN ARMIJO: Thanks, John. We're well ahead of schedule. What I'd like to do is take advantage of the time we have and we will have to move all of our materials to the next meeting room because this room is going to be prepared for tomorrow's meeting.

MEMBER CORRADINI: So, we've got to --

VICE CHAIRMAN STETKAR: We have to move.

CHAIRMAN ARMIJO: Shift to the next room, and come back at 12:30 and we'll start P&P Closed Session

MEMBER CORRADINI: At 12:30.

CHAIRMAN ARMIJO: 12:30.

MEMBER CORRADINI: Okay, so we take our lunch now.

CHAIRMAN ARMIJO: Yes, if you don't mind.

MEMBER CORRADINI: Whatever you tell us.

CHAIRMAN ARMIJO: 12:30 return next door.

(Whereupon, the proceedings went off the record at 11:28 a.m.)

U.S.NRC

United States Nuclear Regulatory Commission

Protecting People and the Environment

Presentation to the ACRS Full Committee – 610th Meeting

Briefing on Calvert Cliffs Unit 3 COL Application Safety Evaluation with Open Items for FSAR Chapters/sections 2.4, 2.5, 3 (except 3.7) 9, 13, and 14

Mike Takacs - Presenter
Surinder Arora – Lead Project Manager

December 5, 2013

Major Milestones - Chronology

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

07/13/2007	Part 1 of the COL Application (Partial) submitted
12/14/2007	Part 1, Rev. 1, submitted
03/14/2008	Part 1, Rev. 2, & Part 2 of the Application submitted
08/01/2008	Revision 3 submitted
03/09/2009	Revision 4 submitted
06/30/2009	Revision 5 submitted
09/30/2009	Revision 6 submitted
12/20/2010	Revision 7 submitted
03/27/2012	Revision 8 submitted
03/28/13	Revision 9 submitted
11/6/13	ACRS subcommittee review complete for the remaining Phase 2 Chapters.

Review Schedule

U.S.NRC
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Phase - Activity	Target Date
Phase 1 - Preliminary Safety Evaluation Report (SER) and Request for Additional Information (RAI)	April 2010 (Actual)
Phase 2 - SER with Open Items	October 9, 2013
Phase 3 – Advisory Committee on Reactor Safeguards (ACRS) Review of SER with Open Items	December 2013
Phase 4 - Advanced SER with No Open Items	Schedule under Review
Phase 5 - ACRS Review of Advanced SER with No Open Items	Schedule under Review
Phase 6 – Final SER with No Open Items	Schedule under Review

Summary of SE with OI: Section 2.4 Hydrologic Engineering

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SRP Section/Application Section		Number of RAI Questions	Number of SE Open Items
2.4	Hydrologic Engineering	3	2
Totals		3	2

Summary of SE with OI: Section 2.4 Hydrologic Engineering

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- **RAI 400, Question 2.4-1**: Inconsistent Depiction of CCNPP Unit 3 Site Boundary - FSAR Revision 9 Figure 2.4-1 shows the outline of the CCNPP Unit 3 site boundary that appears to be inconsistent with FSAR Figures 2.4-17 and 2.4-25.

- **RAI 400, Question 2.4-2**: Estimate of Bounding Value for Subsidence Resulting from Plant Groundwater Use - verify that the estimate of drawdown and subsidence remains bounding given the potential operational use of groundwater identified in the COL FSAR.

Summary of SE with OI: Section 2.5 - Geological, Seismology, and Geotechnical Engineering

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SRP Section/Application Section		Number of RAI Questions	Number of SE Open Items
2.5.1	Basic Geologic and Seismic Information	74	**0**
2.5.2	Vibratory Ground Motion	26	2
2.5.3	Surface Faulting	1	0
2.5.4	Stability of Subsurface Materials and Foundations	**33**	**2**
2.5.5	Stability of Slopes	1	0
Totals		**135**	**4**

Summary of SE with OI: Section 2.5.2 - Vibratory Ground Motion

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- **RAI 381, Question 02.05.02-25**: the staff requested hazard contributions of individual seismic sources to conduct an independent confirmatory study. The staff has not finalized its confirmatory study.

- **RAI 386, Question 02.05.02-26**: the staff requested further information on the sensitivity study conducted to analyze the impact of the Mineral, VA earthquake on the seismicity rate increases.

Summary of SE with OI: Chapter 3 - Design of Structures, Components Equipment and Systems

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SRP Section/Application Section		Number of RAI Questions	Number of SE Open Items
3.2	Classification of Structures, Systems, and Components	13	**0**
3.3	Wind and Tornado Loadings	4	0
3.4	Water Level (Flood) Design	1	**0**
3.5	Missile Protection	33	3
3.6	Protection Against Dynamic Effects Associated with Postulated Rupture of Piping	2	0
3.7	Seismic Design	n/a	n/a
3.8	Design of Category I Structures	**51**	**7**
3.9	Mechanical Systems and Components	**15**	**2**
3.10	Seismic and Dynamic Qualification of Mechanical and Electrical Equipment	1	0
3.11	Environmental Qualification of Mechanical and Electrical Equipment	**11**	**1**
3.12	ASME Code Class 1, 2, and 3 Piping Systems, Piping Components, and their Associated Supports	**1**	**1**
3.13	Threaded Fasteners (ASME Code Class 1, 2, and 3)	0	0
Totals		**132**	**14**

Summary of SE with OI: Section 3.5 – Missile Protection

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- **RAI 376, Question 03.05.01.03-23**: requests the applicant to provide justification on how the Jaquet electronic turbine overspeed protection system reliability data would be equivalent to that provided by a different supplier, and to evaluate how the associated ITAAC commitment is impacted by a different supplier's reliability data.

- **RAI 376, Question 03.05.01.03-24**: requests that applicant to explain how Alstom Document 75C10001 includes all the relevant information such as valve types, valve control, and overspeed protection systems etc. that is included in the U.S. EPR FSAR standard steam turbine.

- **RAI 376, Question 03.05.01.03-25**: requests that the applicant reference all of the reports associated with the turbine missile probability analysis, probability of fatigue, and probability of destructive overspeed in the COL FSAR.

Summary of SE with OI: Section 3.8 – Design of Category I Structures

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- **RAI 301, Question 03.08.04-21**: requests a detailed description of the sliding analysis for each SC-I structure. The description should include the values of itemized lateral forces applied and values of itemized shear resistance.

- **RAI 333, Question 03.08.04-32**: requests additional information to justify the assumption that only the East Wall of the UHS MWIS is subject to breaking wave pressure. Requests information on the consideration of the run-up water elevation in the design of the exterior walls of the UHS MWIS.

- **RAI 339, Question 03.08.04-33**: requests the technical basis that the CCNPP method to determine the design member forces due to seismic loads is at least as conservative as the U.S. EPR method or more detailed methods.

Summary of SE with OI: Section 3.8 – Design of Category I Structures

U.S.NRC
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- **RAI 339, Question 03.08.04-34**: requests the values of the maximum soil pressures considering all locations of the CBIS basemat design, explanation on how these pressures are obtained, and explanation whether the CCNPP Unit 3 bearing capacities provided in the FSAR are the bearing capacities for localized pressure.

- **RAI 308, Question 03.08.05-9**: requests to explain how the new and updated COL Items regarding settlement of the ESWBs will be addressed and what site-specific conditions will be considered. Also requests to provide additional information on the methodology and procedures used for the settlement evaluation of the CBIS foundation.

Summary of SE with OI: Chapter 9 Auxiliary Systems

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SRP Section/Application Section		Number of RAI Questions	Number of SE Open Items
9.1	Fuel Storage and Handling	2	0
9.2	Water Systems	36	**1**
9.3	Process Auxiliaries	IBR	0
9.4	Air Conditioning, Heating, Cooling, and Ventilation Systems	8	**0**
9.5	Other Auxiliary Systems	23	0
Totals		69	**1**

Summary of SE with OI: Section 9.2 Water Systems

U.S.NRC
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- **RAI 398, Question 09.02.05-32**: Clarification related to the CFD computer model uncertainties, meteorological conditions, and boundary scenarios regarding UHS cooling towers.

Summary of SE with OI: Chapter 13 Conduct of Operations

U.S.NRC
United States Nuclear Regulatory Commission
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SRP Section/Application Section		Number of RAI Questions	Number of SE Open Items
13.1	Organizational Structure of Applicant	1	0
13.2	Training	1	0
13.3	Emergency Planning	**66**	**8**
13.4	Operational Program Implementation	1	0
13.5	Plant Procedures	0	0
13.6	Security	109	0
13.7	Fitness for Duty	4	0
13.8	Cyber Security	4	0
Totals		**186**	**8**

Summary of SE with OI: Chapter 14 Verification Programs

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

SRP Section/Application Section		Number of RAI Questions	Number of SE Open Items
14.1	Specific Information for the Initial Plant Test Program	0	0
14.2	Initial Plant Test Program	60	**0**
14.3	Inspections, Tests, Analyses, and Acceptance Criteria	0	0
14.3.1	Selection Criteria and Methodology	45	**0**
14.3.2	Structural and Systems Engineering	20	1
14.3.3	Piping Systems and Components	5	**1**
14.3.4	Reactor Systems	0	0
14.3.5	Instrumentation and Controls	0	0

Summary of SE with OI: Chapter 14 Verification Programs (cont.)

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

SRP Section/Application Section		Number of RAI Questions	Number of SE Open Items
14.3.6	Electrical Systems	2	0
14.3.7	Plant Systems	1	0
14.3.8	Radiation Protection	0	0
14.3.9	Human Factors Engineering	0	0
14.3.10	Emergency Planning	3	0
14.3.11	Containment Systems	0	0
14.3.12	Physical Security Hardware	8	0
Totals		146	**2**

Summary of SE with OI: Sections 14.3.2, Structural and Systems Engineering and 14.3.3, Piping Systems and Components

U.S.NRC
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- **RAI 367, Question 14.03.02-20**: Request to provide design information for seismic Category-II structures to meet ITAAC requirements for ensuring that failure of non-Seismic Category I structures will not impair the safety capability of adjacent safety-related SSCs.

- **RAI 161, Question 14.03.03-02**: For clarity and inspectability, the staff determined that three ITAAC covering 1) design, 2) fabrication and installation, and 3) as-built reconciliation are necessary and sufficient to ensure the piping systems and components are properly designed and constructed in accordance with the ASME Code Section III requirements.

ACRONYMS

U.S.NRC
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- ASME - American Society of Mechanical Engineers
- EAL - Emergency Action Level
- EPGB - Emergency Power Generating Buildings
- ESWB - Essential Service Water Buildings
- CBIS - Common Basemat Intake Structure
- UHS MWIS - Ultimate Heat Sink Makeup Water Intake Structure
- CWS MWIS - Circulating Water System Makeup Water Intake Structure
- PMH - Probable Maximum Hurricane
- SPH - Standard Project Hurricane
- CS - Conventional Seismic
- CCNPP - Calvert Cliff Nuclear Power Plant
- CFD - Computational Fluid Dynamics
- NI - Nuclear Island

UNISTAR NUCLEAR ENERGY

Presentation to ACRS Full Committee
U.S. EPR™
Calvert Cliffs Nuclear Power Plant Unit 3
FSAR Chapters 2.4, 2.5, 3, 9, 13 and 14
December 5, 2013

Introduction

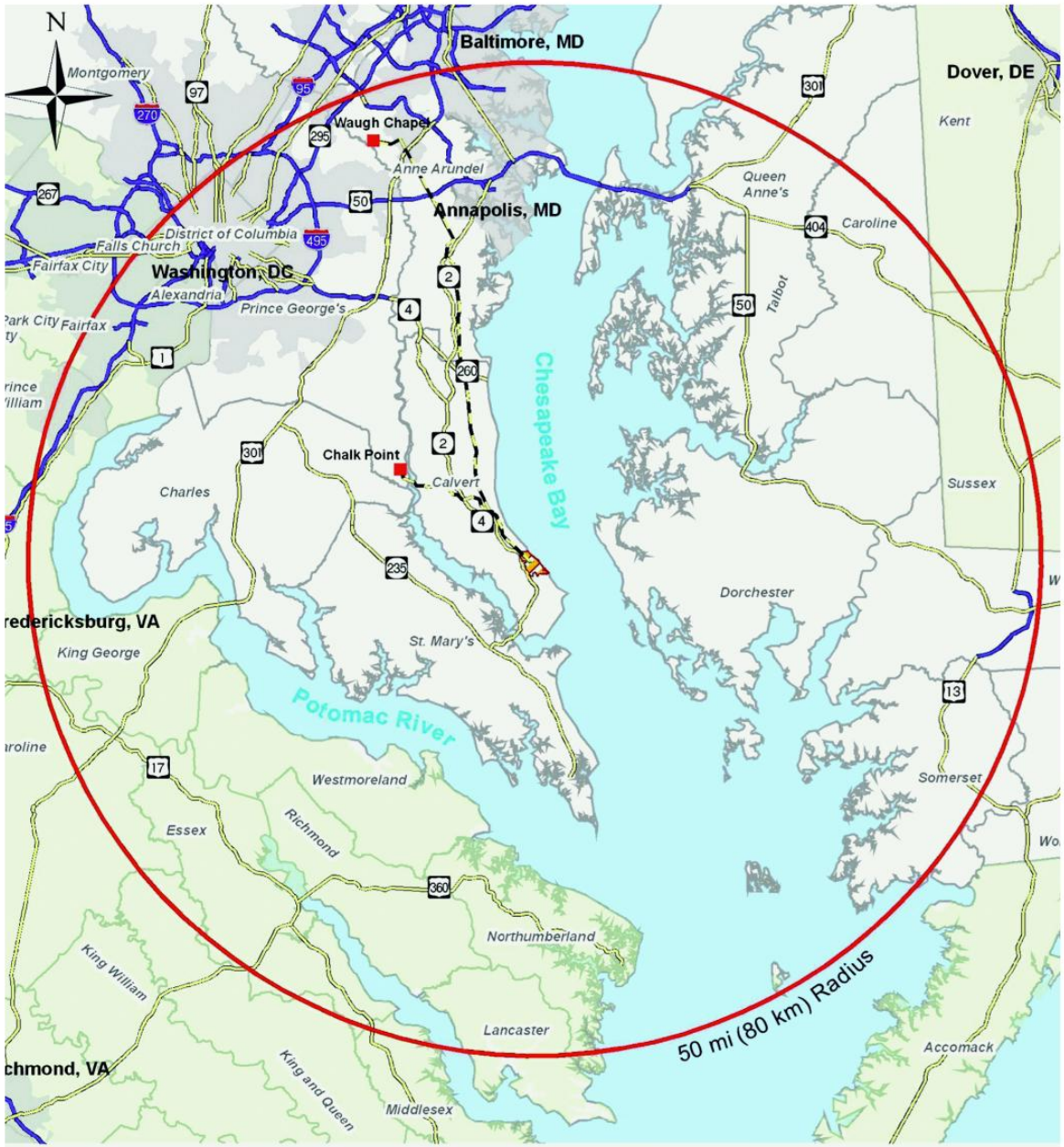
- Today Mark Finley, UniStar - President, CEO and CNO, will lead the Calvert Cliffs Unit 3 presentation.
- Presentation was prepared by UniStar and is supported by:
  - Robert Randall, UniStar –Engineering Manager
  - Antonio Fernandez, PhD, PE, UniStar – Structural/Seismic Engineering
  - Mark Hunter, UniStar – Director Operations and Maintenance
  - Onur Tastan, Rizzo Associates – Structural/Seismic Engineering
  - Todd Oswald, AREVA — U.S. EPR Technical Consultant Civil Structural
  - Ahmed “Jemie” Dababneh, PhD, Rizzo Associates –Technical Director
  - Shankar Rao, Bechtel – Project Engineer
  - Mustafa Samad, PhD, Bechtel – Sr. Engineering Specialist-Hydrology
  - Stephen Huddleston, AREVA – Engineering Manager, BOP Systems
  - Kelly Knight, PhD, Bechtel - Engineering Manager

Calvert Cliffs Unit 3
Chapters 2.4, 2.5, 3, 9, 13 and 14
Overview

Calvert Cliffs Unit 3 Summary				
Chapter	# Departures	#Exemptions	# SER Open Items	# SER Open Items Responses Submitted
2.4	0	0	2	1
2.5	4	4	8	8
3	0	0	36	36
9	3	0	4	4
13	0	0	6	6
14	0	0	37	37
Totals	7	4	93	92

Calvert Cliffs Unit 3
ACRS Full Committee Meeting
Introduction

- UNE is responsible for the design of Calvert Cliffs Unit 3 and develops the design primarily through contracts with Bechtel and AREVA.
- Reference Combined License Application (RCOLA) authored using 'Incorporate by Reference' (IBR) methodology.
- The focus of today's presentation will be a summary of the third set (4½) of FSAR Chapters that have been presented to the U.S. EPR ACRS Subcommittee.
- The first Calvert Cliffs Unit 3 ACRS Full Committee meeting, addressing the first set (9½) of FSAR Chapters, was conducted on April 7, 2011.
- The second Calvert Cliffs Unit 3 ACRS Full Committee meeting, addressing the second set (4) of FSAR Chapters, was conducted on April 12, 2012.
- For today's presentation only supplemental information, or site-specific information, departures or exemptions from the U.S. EPR FSAR are discussed.


N
Baltimore, MD
Dover, DE
Montgomery
Waugh Chapel
Anne Arundel
Annapolis, MD
Queen Anne's
Kent
Caroline
District of Columbia
Falls Church
Fairfax City
Washington, DC
Alexandria
Prince George's
Fairfax
Talbot
Chesapeake Bay
Chalk Point
Calvert
Charles
Sussex
Dorchester
redericksburg, VA
King George
St. Mary's
Potomac River
Somerset
Westmoreland
Essex
Richmond
Northumberland
King William
Lancaster
Accomack
King and Queen
Middlesex
chmond, VA
50 mi (80 km) Radius

List of Chapters

- Chapter 2.4, Hydrologic Engineering
- Chapter 2.5, Geology, Seismology, and Geotechnical Engineering
- Chapter 3, Design of Structures, Components, Equipment, and Systems, (except Section 3.7, Seismic Design)
- Chapter 9, Auxiliary Systems
- Chapter 13, Conduct of Operations
- Chapter 14, Verification Programs

2.4 HYDROLOGIC ENGINEERING

2.4 Hydrologic Engineering
Hydrologic Description

- Hydrological Characteristics
  - The Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 site is located on the Calvert peninsula within the Chesapeake Bay watershed, adjacent to and southeast of CCNPP Units 1 and 2.
  - The Chesapeake Bay constitutes the main water body influencing the siting of CCNPP Unit 3.
  - The Calvert peninsula is formed by the Chesapeake Bay to the east and the Patuxent River to the west.
  - Drainage in the vicinity of the CCNPP site includes several small streams and creeks, which fall within two sub-watersheds of the Chesapeake Bay with the drainage divide running nearly parallel to the shoreline.
  - All streams and creeks near the CCNPP Unit 3 site east of Maryland State Highway (MD) 2/4 are non-tidal.

2.4 Hydrologic Engineering
Hydrologic Description

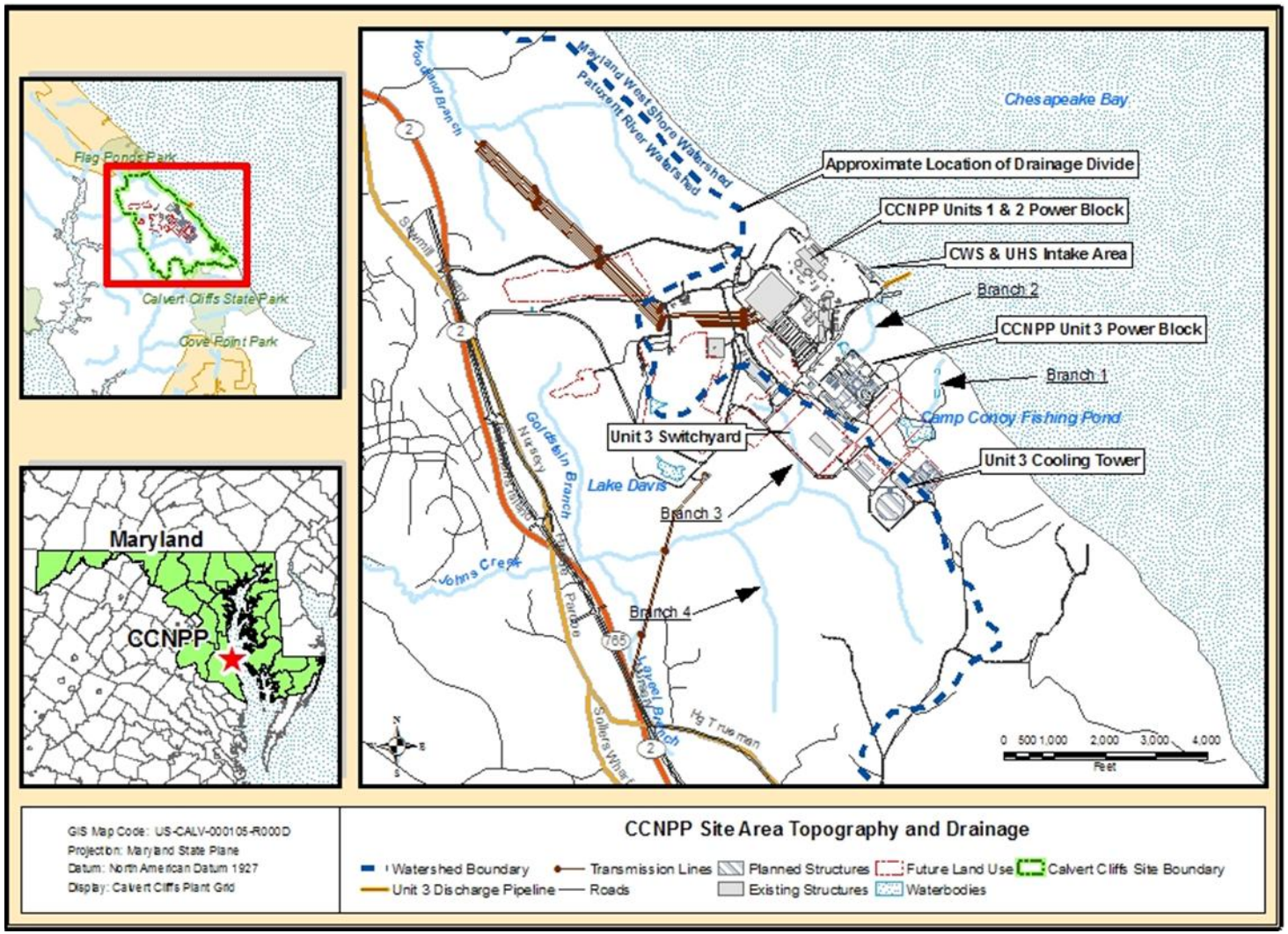
- Plant Siting
  - The CCNPP Unit 3 safety-related structures, systems and components (SSCs) will be located within the Maryland Western Shore Watershed at the Power Block area and at the Ultimate Heat Sink (UHS) Makeup Water Intake Structure (MWIS) area.
  - Access to safety-related structures, systems and components (SSCs) in the power block area will be located at or above Elevation 84.6 ft.
  - The deck of the UHS MWIS will be at approximately Elevation 11.5 ft with openings or entrances to the MWIS located at or above Elevation 36.5 ft.

2.4 Hydrologic Engineering
Hydrologic Description

Aerial View of CCNPP Unit 3 Site on the Calvert Peninsula

2.4 Hydrologic Engineering
Hydrologic Description

CCNPP Unit 3 Site Area

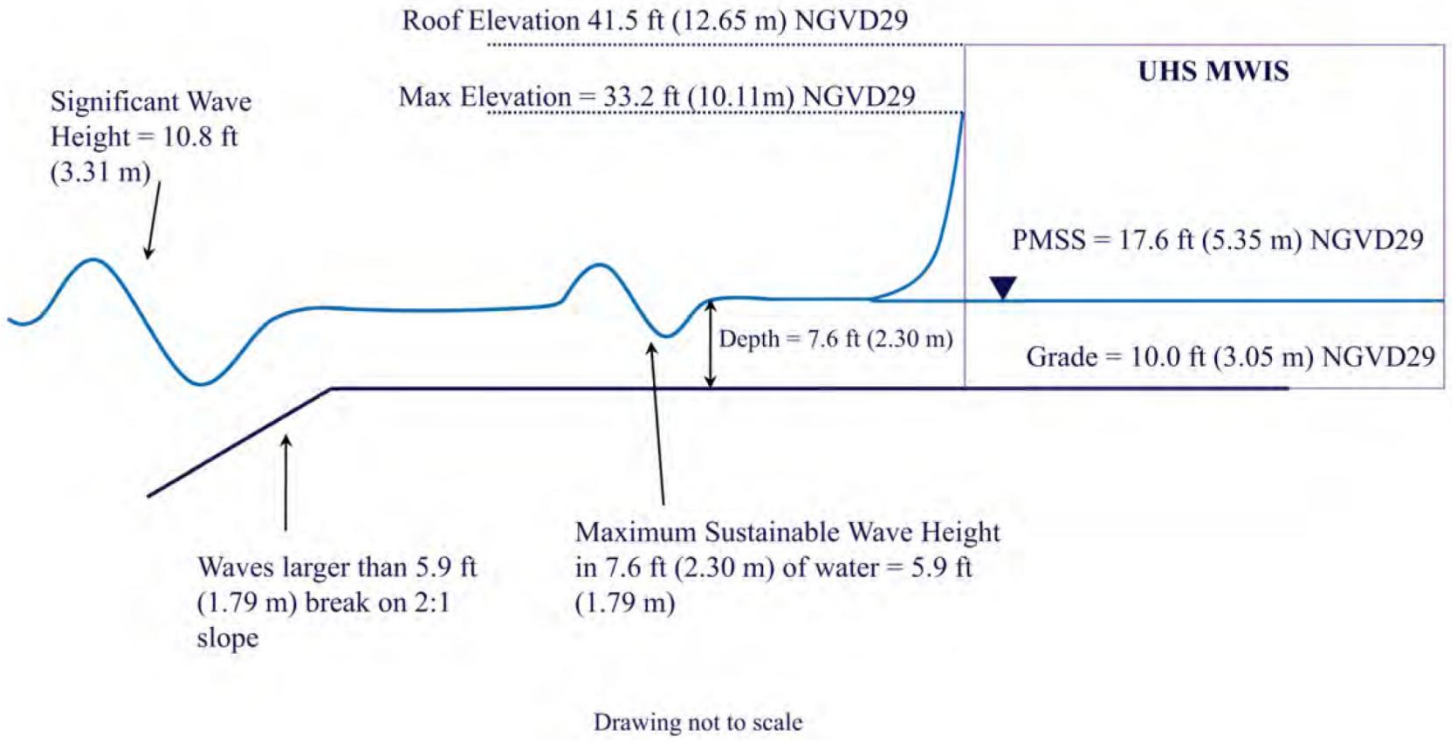


2.4 Hydrologic Engineering
Probable Maximum Surge and Seiche Flooding

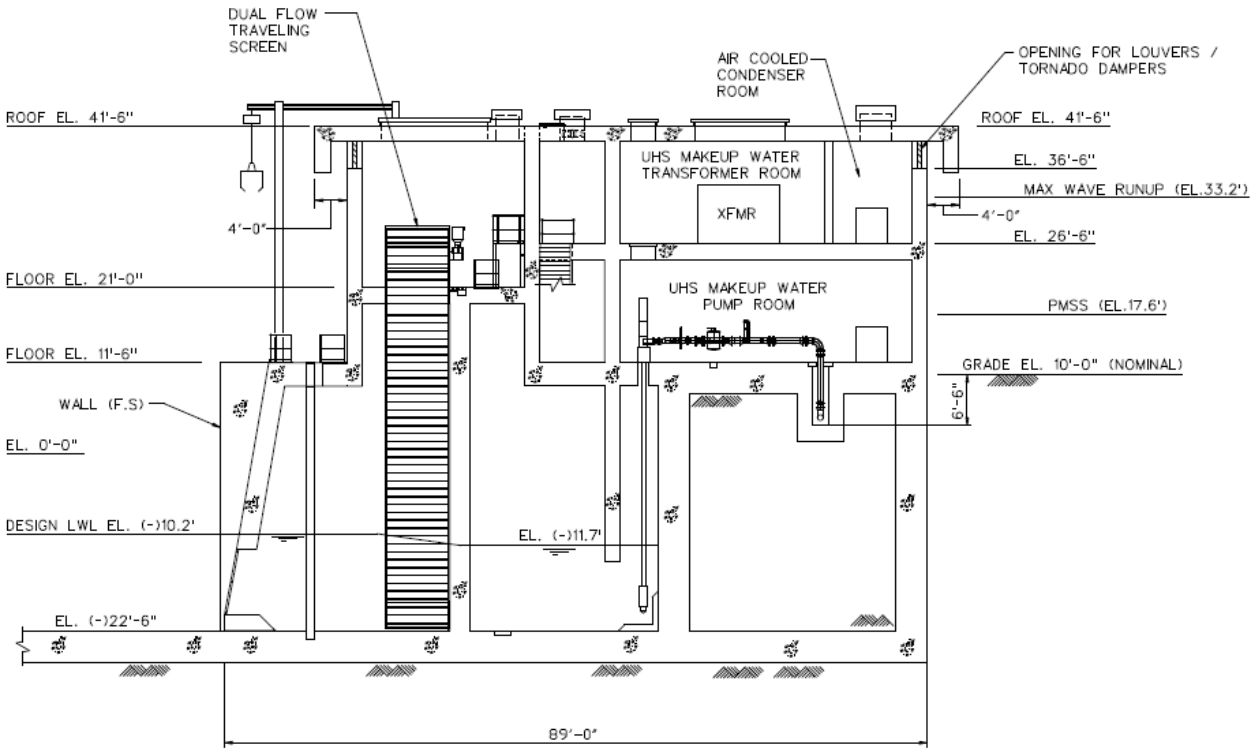
- Probable Maximum Storm Surge (PMSS) and Seiche Flooding
  - The Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model predicted a maximum surge elevation at the site of 11.0 ft from a water level of 0.0 NGVD 29. The simulated surge height was then adjusted to take into account the 20% margin (SLOSH model uncertainties) suggested in Technical Report National Weather Service (NWS) 48 (Jelesnianski, 1992) and the antecedent water level of 4.4 ft NGVD 29. The final PMSS elevation thus obtained is 17.6 ft NGVD 29.
  - The maximum wave runup on the intake structure was computed to be 15.6 ft. This runup, combined with the PMSS, will reach an elevation of 33.2 ft NGVD 29 as shown on Figure 2.4-33.
  - Because the effects of seiche oscillation are eliminated by a change in sustained wind direction, any existing seiche oscillation in the Chesapeake Bay prior to the arrival of any hurricane will be eliminated by the strong and changing wind field of the hurricane. Hence, resonance of seiche oscillation with PMSS is precluded.

2.4 Hydrologic Engineering
Probable Maximum Surge and Seiche Flooding

Figure 2.4-33— {Schematic Diagram Wave Runup on the UHS Makeup Water Intake Structure (MWIS)}



2.4 Hydrologic Engineering
Probable Maximum Surge and Seiche Flooding
UHS MWIS Cross Section



UHS MAKEUP WATER INTAKE STRUCTURE
ELEVATION LOOKING EAST

2.4 Hydrologic Engineering
Probable Maximum Tsunami Flooding

- Probable Maximum Tsunami (PMT) Flooding
  - The PMT amplitude and drawdown at the CCNPP site were computed for the three potential tsunami sources using the maximum and minimum tsunami-induced water surface elevations.
  - The maximum simulated amplitude and drawdown at the CCNPP site were obtained from the postulated submarine landslide at the Virginia-North Carolina continental shelf off the coast of Norfolk, Virginia.
  - The PMT amplitude was estimated to be 1.71 ft above the antecedent water level. Combining with the antecedent water level of 4.34 ft and tsunami runup of 5.13 ft, the PMT high water level is estimated as 11.18 ft or rounded up to 11.5 ft.
  - The PMT drawdown was estimated to be 1.24 ft below the antecedent water level. Combining with the mean lower-low water antecedent water level, the PMT low water level is estimated as -1.23 ft or rounded down to -1.5 ft.
  - Because the maximum and the minimum water levels at the CCNPP site would be affected by storm surges, the maximum and minimum water levels from the PMT did not represent limiting flood or low water design bases for the CCNPP site.

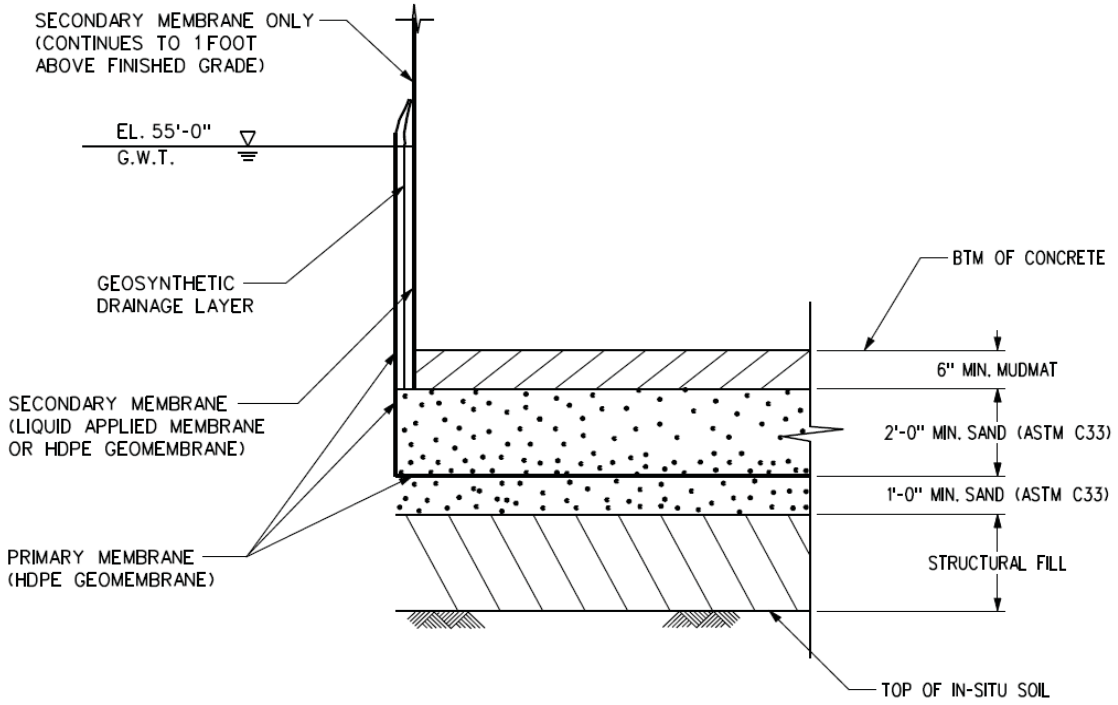
2.4 Hydrologic Engineering
Groundwater

- Groundwater in the surficial aquifer at the Calvert Cliffs Unit 3 site is aggressive (pH ~5.2).
  - This affects the portions of structures that are below the water table (at least 30' below power block grade) but not at MWIS.
  - Waterproofing system will protect the portions of the Nuclear Island (NI) and Essential Service Water Buildings (ESWBs) that are below the groundwater water table.
  - Water level will be monitored behind waterproofing system with the capability to dewater if necessary.
  - Dampproofing system will protect the Emergency Power Generating Buildings (EPGBs) that are above groundwater table.
- UHS Makeup water (from Chesapeake Bay) is brackish.
  - Concrete structures subject to brackish water (MWIS and ESWB) will use concrete with a maximum water-cementitious materials ratio of 0.4 and a minimum compressive strength of 5000 pounds per square inch (psi).

2.4 Hydrologic Engineering
Groundwater

Waterproofing system will protect the portions of the NI and Essential Service Water Buildings (ESWBs) below the groundwater table.

- Waterproofing system
  - Primary and secondary membranes
  - Groundwater monitor system
  - Vertical drainage system placed between primary and secondary systems to facilitate flow of leaked groundwater down to sump pumps



Chapter 2.4
Hydrologic Engineering
Summary

- Fifteen (15) COL Information Items, as specified by U.S. EPR FSAR, are addressed in Calvert Cliffs Unit 3 FSAR Chapter 2.4
- No ASLB Contentions
- No Departures or exemptions from the U.S. EPR
- Two (2) SER Open Items
- One SER Open Item Request for Additional Information (RAI) has been responded to, and the other is scheduled for early 2014.

2.5 GEOLOGY, SEISMOLOGY, AND GEOTECHNICAL ENGINEERING

2.5 Geology, Seismology, and Geotechnical Engineering
Vibratory Ground Motion

- Vibratory Ground Motion
  - A detailed review of the vibratory ground motion assessment was carried out for the CCNPP Unit 3 site, resulting in the development of the CCNPP Unit 3 Ground Motion Response Spectra.
  - As the first step in this process, a Probabilistic Seismic Hazard Assessment (PSHA) for a hard rock condition was performed taking into account guidance in NRC Regulatory Guide 1.208.
    - ✓ The recently developed seismic source characterization (SSC) for the Central and Eastern United States (CEUS SSC) (EPRI/DOE/NRC, 2012)
    - ✓ The EPRI (2004, 2006) ground motion characterization (GMC) model.

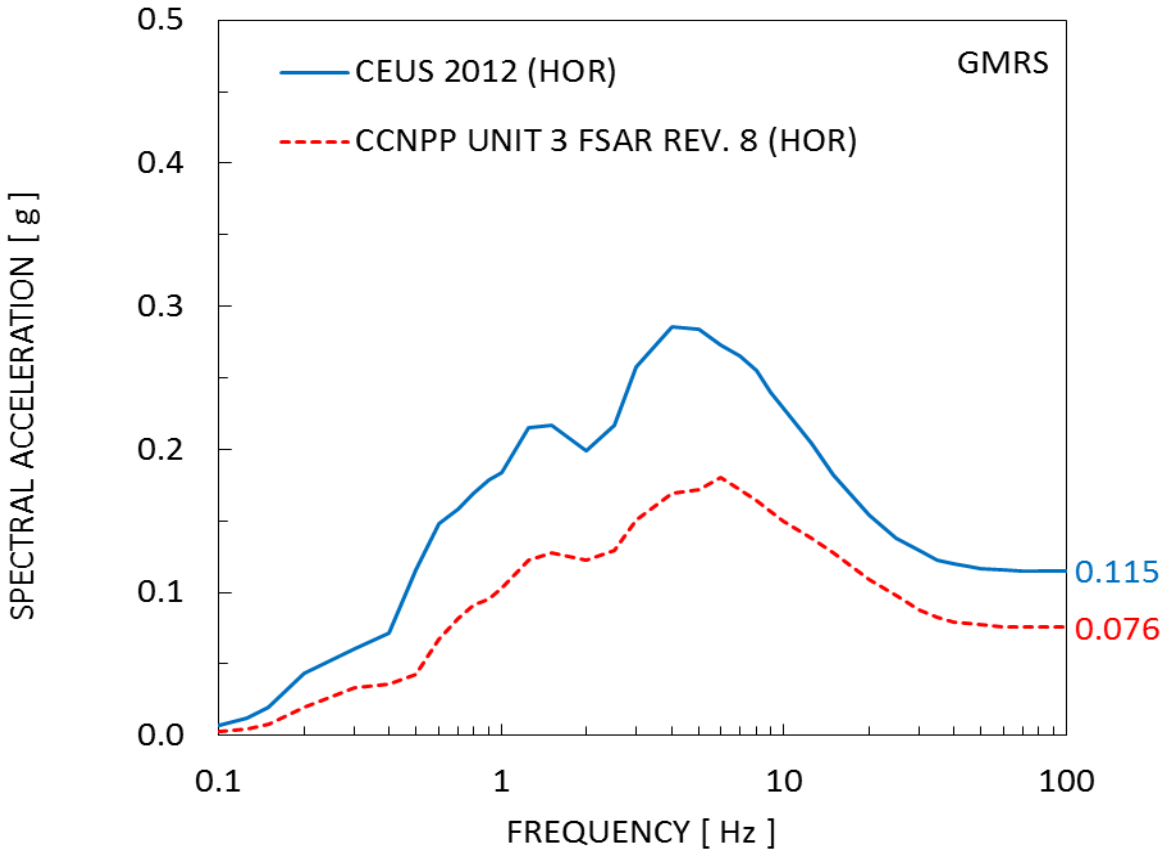
2.5 Geology, Seismology, and Geotechnical Engineering
Vibratory Ground Motion

➢ Mineral Virginia Earthquake

- August 23, 2011, M 5.8 from the Central Virginia Seismic Zone (CVSZ)
- CEUS SSC catalog predates the Mineral Virginia Earthquake (MVE).
- UniStar has performed the necessary evaluations to verify that the CEUS 2012 SSC catalog adequately accounts for events such as the MVE.
- Mineral Virginia Earthquake and Aftershocks (SER-Open Item RAI 385)

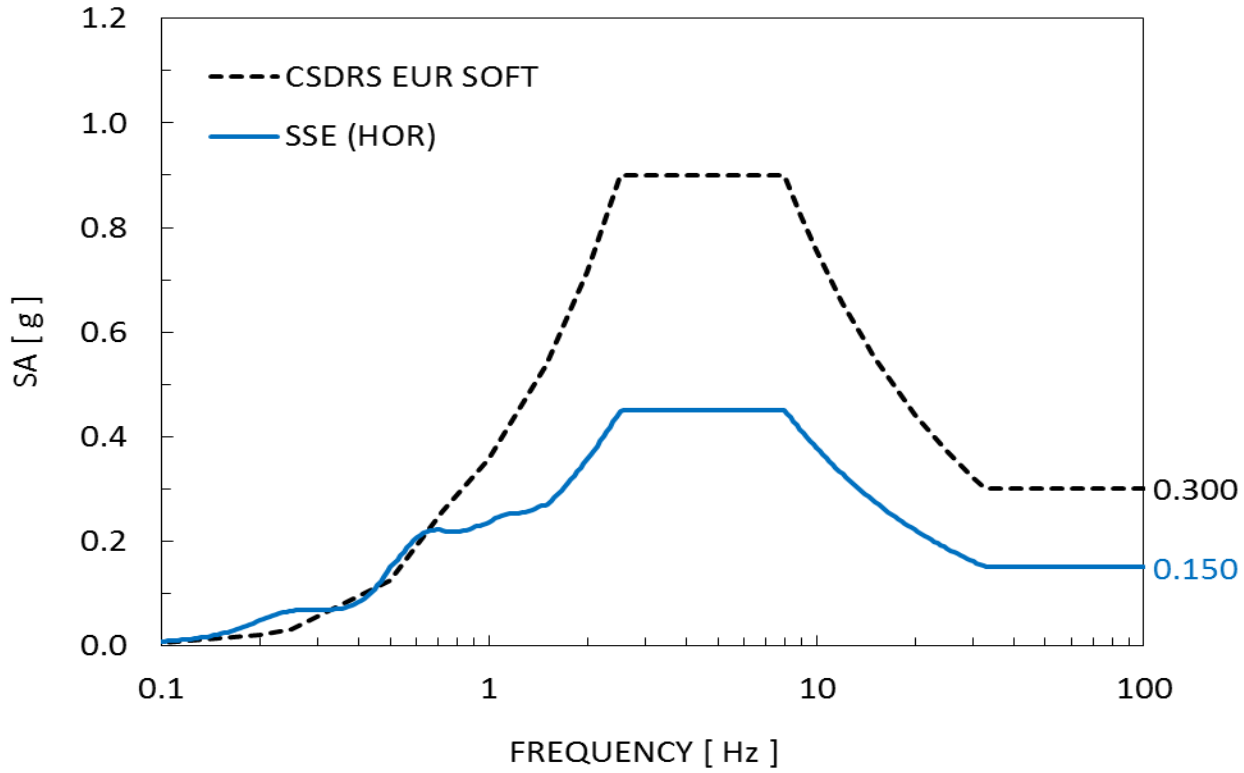
2.5 Geology, Seismology, and Geotechnical Engineering Vibratory Ground Motion

IMPACT OF 2012 CEUS SSC



2.5 Geology, Seismology, and Geotechnical Engineering Vibratory Ground Motion

Safe Shutdown Earthquake (SSE) & Certified Seismic Design Response Spectra (CSDRS)



The site specific soil structure interaction (SSI) analysis is performed with the use of the CCNPP Unit 3 SSE, therefore, the exceedance will be directly accounted for in the design of structures, systems, and components.

2.5 Geology, Seismology, and Geotechnical Engineering Departure/Exemption

Departure/Exemption from Minimum Shear Wave Velocity

- Departure/Exemption: Low Strain Shear Wave Velocity
  - The shear wave velocity (LOW STRAIN), at the foundation elevation of the Emergency Power Generation Buildings (EPGBs), is lower than 1000 fps, which is the minimum requirement defined by the U.S. EPR.
  - This departure/exemption is reconciled in FSAR Section 3.7 with a site-specific soil structure (SSI) interaction analysis.

Departure/Exemption from Safe Shutdown Earthquake

- Departure/Exemption: Safe Shutdown Earthquake (SSE) exceeds the US EPR Certified Design Response Spectra (CSDRS) at low frequencies (< 0.3 Hz)
  - This departure/exemption is reconciled in FSAR Section 3.7 with a site-specific soil structure (SSI) interaction analysis that uses the SSE as the seismic input

2.5 Geology, Seismology, and Geotechnical Engineering Departure/Exemption

Departure/Exemption from Soil Properties

- Departure/Exemption: soil properties that fall beyond the analysis bounds of the U.S. EPR (Minimum dynamic bearing capacity, Maximum angle of internal friction, Soil Density, Minimum Coefficient of Static Friction: 0.47, NAB Coefficients of Friction (μ): 0.47)
  - This departure/exemption is reconciled in FSAR Section 3.7 with soil structure interaction and stability analyses that use the site-specific soil properties

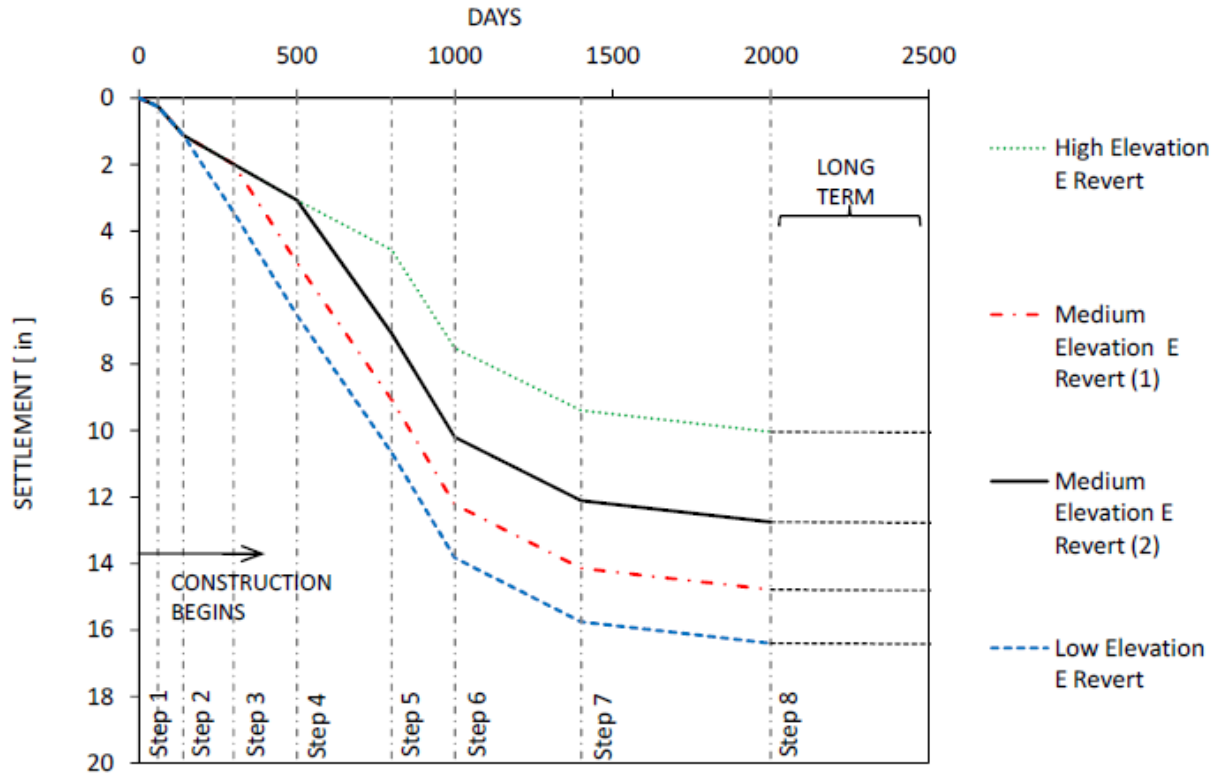
Departure/Exemption from Maximum Differential Settlement of 1/2 inch/50 ft (1/1200) Any Direction Across the Basemat

- Emergency Power Generating Buildings (EPGBs) & Essential Service Water Buildings (ESWBs) estimated site-specific tilt is higher than the allowable value.
  - Evaluation of the effects of the higher tilt, a finite element analysis of the EPGB & ESWB
    - ✓ Results show that increase in design moment based on the additional tilt is less than the U.S. EPR FSAR maximum design moment.
- Therefore, EPGB & ESWB basemats are structurally adequate to resist the increased moments.

2.5 Geology, Seismology, and Geotechnical Engineering
Settlement

- The settlement (total settlement and tilt) and excavation related heave of the CCNPP Powerblock Area was carried out under the following premises:
  - Develop a 3D finite element model capable of capturing irregular subsurface conditions, realistic foundation footprint shapes, and asymmetric building loads.
  - Perform a time-dependent simulation, that provides settlement and tilt estimates as a function of time through and after construction.
  - Incorporate a construction sequence and examine the behavior of settlement and tilt as buildings are erected.
  - Account for asymmetric topography, by recognizing that reloading time to original consolidation pressure after excavation, will be variable throughout the foundation footprint.
  - Perform the settlement analysis simultaneously for the NI and adjacent facilities, including the detached safety related structures (EPGB and ESWB).
- The settlement model in the Intake Area is developed in a similar form. The model is much simpler and the influence of neighboring structures is negligible.

2.5 Geology, Seismology, and Geotechnical Engineering Settlement



Notes:

- *Low Elevation: revert to loading modulus at the end of the 2nd load step (140 days)*
- *Medium Elevation (1): revert to loading modulus at the end of the 3rd load step (300 days)*
- *Medium Elevation (2): revert to loading modulus at the end of the 4th load step (500 days)*
- *High Elevation: revert to loading modulus at the end of the 5th load step (800 days)*
- *Long term settlement estimate due to creep and rewatering offset each other and are not significant*

Chapter 2.5
Geology, Seismology, and Geotechnical Engineering
Summary

- Eleven (11) COL Information Items, as specified by U.S. EPR FSAR, are addressed in Calvert Cliffs Unit 3 FSAR Chapter 2.5
- No ASLB Contentions
- Four (4) Departures and four (4) Exemptions from the U.S. EPR FSAR for Calvert Cliffs Unit 3, Chapter 2.5
- Eight (8) SER Open Items
- All RAI responses have been submitted

3.8 Design of Category I Structures

Design of Structures, Components, Equipment and Systems
Other Seismic Category I Structures

Description of the Structures

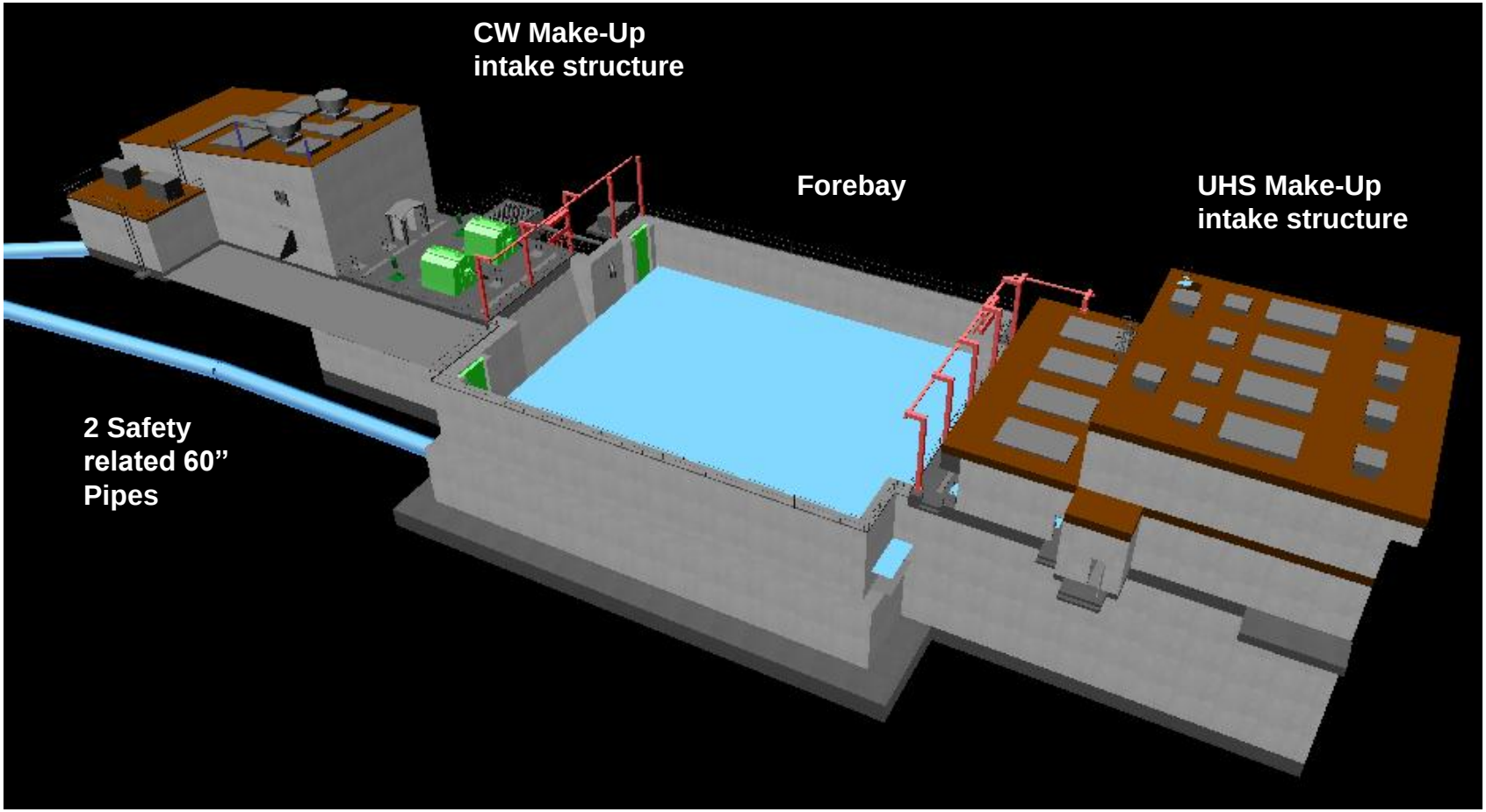
- The standard plant layout and design of other Seismic Category I Structures is as described in the U.S. EPR FSAR without departures.
- The site-specific Seismic Category I structures are:
  - Forebay and UHS Makeup Water Intake Structure (MWIS)
  - Buried Conduit Duct banks
  - Buried Pipe

Design of Structures, Components, Equipment and Systems Foundations

Forebay and UHS Makeup Water Intake Structure

- The Seismic Category I Forebay and UHS MWIS are reinforced concrete structures situated along Chesapeake Bay.
- The UHS MWIS is integrally connected with the Forebay basemat.
- Seismic Category II Circulating Water System (CWS) Makeup Water Intake Structure and Seismic Category I Forebay and UHS Makeup Water Intake Structure share a 5 ft thick common basemat.
- Forebay and UHS Makeup Water Intake Structure
  - Reinforced concrete shear wall and slabs are designed for seismic (including hydrodynamic loads) and non-seismic load combinations.
  - Exterior walls are designed to withstand
    - ✓ Tornado missile impact and
    - ✓ Wave pressures of the Probable Maximum Hurricane (PMH)
    - ✓ Standard Project Hurricane (SPH) severe environmental event
  - Checked for sliding, overturning, and flotation using the stability load combination.

Design of Structures, Components, Equipment and Systems Foundations



Chapter 3
Design of Structures, Components, Equipment and Systems

Summary

- Seventy-six (76) COL Information Items, as specified by U.S. EPR FSAR, are addressed in Calvert Cliffs Unit 3 FSAR Chapter 3
- No ASLB Contentions
- No Departures or exemptions from the U.S. EPR FSAR for Calvert Cliffs Unit 3, Chapter 3
- Thirty-six (36) SER Open Items
- All RAI responses have been submitted

Chapter 9
Auxiliary Systems

9.2 WATER SYSTEMS

9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System
Supplemental Information

- Ultimate Heat Sink (UHS) Makeup System
  - Normal nonsafety-related Essential Service Water makeup provides desalinated water to replenish UHS inventory losses.
  - UHS cooling tower normal blowdown discharges water to the retention basin.
  - Emergency safety-related UHS Makeup Water system provides Chesapeake Bay makeup water to each operating UHS cooling tower basin, starting 72 hours post-accident, at a maximum flow rate of 750 gpm and approximately 510 gpm of makeup when the screen wash is operating (300 gpm is required to the basin).
  - Emergency safety-related blowdown is provided, if the normal path is unavailable.
  - The UHS Makeup Water System is designed to permit periodic inspection of components necessary to maintain the integrity and capability of the system to comply with 10 CFR 50 Appendix A, General Design Criterion (GDC) 45.
  - The UHS Makeup Water System is designed to permit operational functional testing of safety-related components to ensure operability and performance of the system to comply with 10 CFR 50 Appendix A, GDC 46.

9.2 WATER SYSTEMS
Post-DBA UHS Makeup Keep-Fill Piping Departure

- Departure: Post-Design Basis Accident (DBA) UHS Makeup Keep-Fill Piping
  - The U.S. EPR Figure 9.2.5-1 does not contain a provision to compensate for the UHS Makeup Water System leakage and maintain the water level in the piping full at all times.
  - The normal UHS makeup keep fill system is designed to provide desalinated water to maintain UHS makeup system full during normal plant operation.
  - The Post-DBA UHS Makeup Keep-Fill line is added to deliver makeup water from the Essential Service Water System (ESWS) to the UHS Makeup Water System to compensate for the leakage loss due to pressure boundary isolation valves, and to keep the UHS Makeup Water System piping full of water at all times.
  - Therefore, the ESWS Emergency Makeup Water line piping and the ESW System return line piping are modified from the configuration in the design certification.
  - The UHS Makeup Water System pressure boundary is maintained through the safety-related Post-DBA UHS Makeup Keep-Fill line check valve.

9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System
Cooling Tower Basin

- Maximum Evaporation and Drift in the Ultimate Heat Sink
  - The U.S. EPR and CCNPP Unit 3 utilize the same 72-hour period of temperature data to determine maximum evaporation of water from the UHS. Therefore, the worst CCNPP Unit 3 meteorological conditions resulting in maximum evaporation and drift loss of water for the UHS over a 72 hour period are bounded by U.S. EPR FSAR Table 9.2.5-3.
  - The Technical Specification required UHS Cooling Tower basin minimum inventory is sufficient to provide 72 hours of cooling following a DBA without makeup.
  - The CCNPP Unit 3 UHS Makeup Water System provides ≥ 300 gpm (required by USEPR FSAR), of makeup water to the each of the four UHS Cooling Tower basin starting 72 hours post DBA.
  - The CCNPP Unit 3 UHS Makeup Water pumps are sized to provide a maximum of approximately 750 gpm to the UHS Cooling Tower basin to maintain adequate Net Positive Suction Head (NPSH) for the ESWS pump for up to 30 days after the DBA and providing for intermittent operation of the screen wash system.

9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System
Cooling Tower Basin

- The maximum non-coincident wet bulb temperature plus the site-specific wet bulb correction factor for Calvert Cliffs 3 exceeds the value provided in U.S. EPR FSAR Table 9.2.5-2, and, therefore, a site specific analysis was done:
  - The U.S. EPR FSAR Table 9.2.5-2 value is 81°F, and the correction factor is 2.5°F.
  - The site-specific maximum (0% exceedance) non-coincident wet bulb temperature is 85.3°F.
  - The site-specific wet bulb correction factor was determined by computational fluid dynamics analysis, considering the meteorology of the site, to be less than 2.5°F.
  - UHS cooling tower performance was verified by showing that the maximum UHS cold water return temperature was less than 95°F, assuming the worst combination of 24-hour temperature conditions from the perspective of minimum cooling from a 30-year hourly regional climatological data set, and assuming a correction factor of 2.5°F.

9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System
Mechanical Draft Cooling Towers

- UHS Cooling Tower Interference on Safety-Related Intakes
  - An evaluation has been performed of the interference effects of the UHS cooling tower plumes on nearby safety-related air intakes.
  - The evaluation concluded that there are no adverse effects on the safety functions of the systems, either due to insensitivity to higher wet bulb temperatures or design features that isolate the fresh air intake of the system.
  - For Main Control Room (MCR) and Safeguard Building (SB) Heating Ventilation & Air Conditioning (HVAC), there is sufficient margin in the system to accommodate the minor effects of a small wet bulb temperature increase – determined to be less than 2.5°F by computational fluid dynamics analysis.

Chapter 9
Auxiliary Systems
Summary

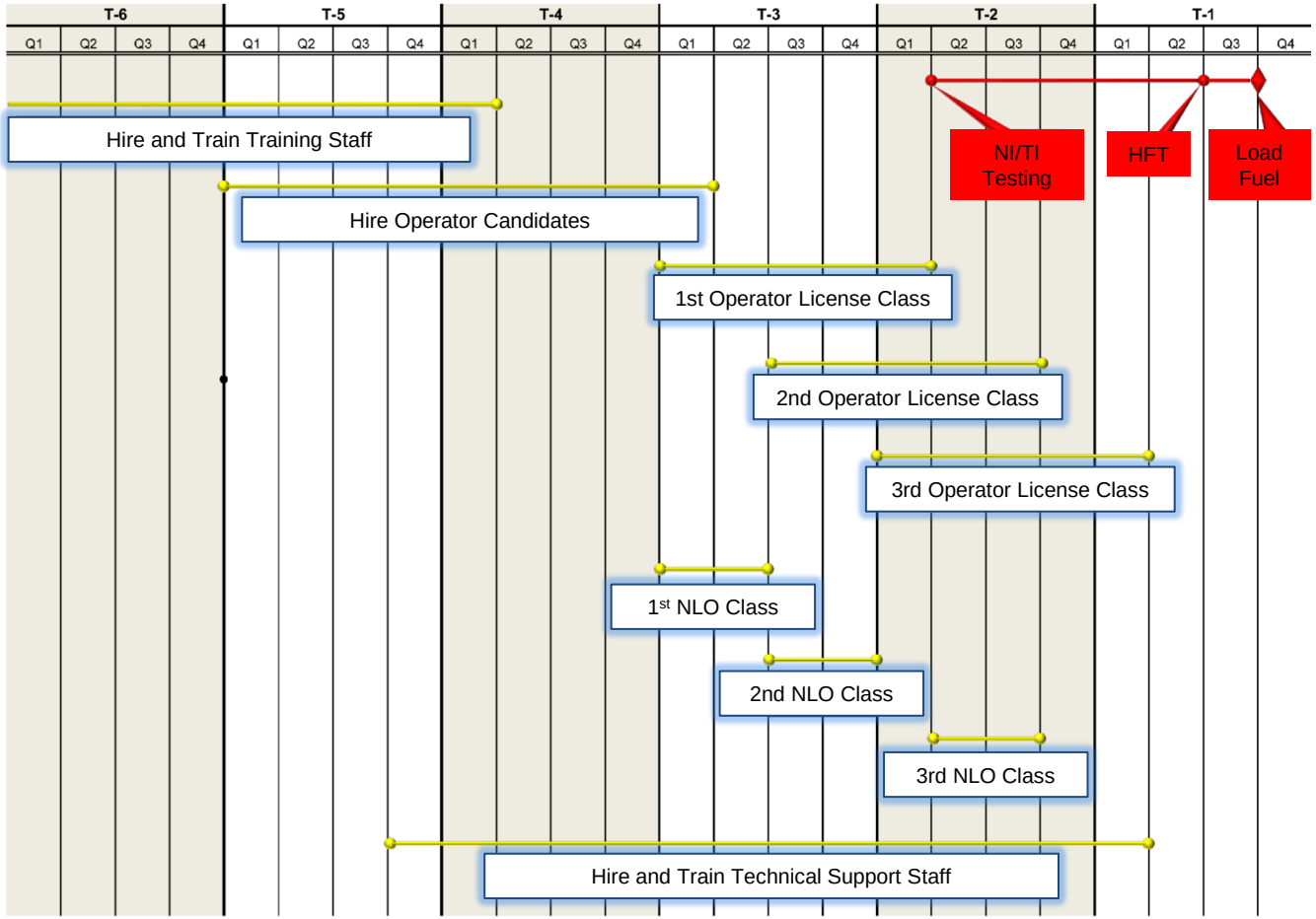
- Thirty Five (35) COL Information Items, as specified by U.S. EPR FSAR, are addressed in Calvert Cliffs Unit 3 FSAR Chapter 9
- No ASLB Contentions
- Three (3) Departures and No Exemptions from the U.S. EPR FSAR Chapter 9
- Four (4) SER Open Items
- All RAI responses have been submitted

13.2 TRAINING

13.2 Training
Training Programs

- Training
  - Follows NEI 06-13A “Template for an Industry Training Program Description” including Appendix A (Cold License Training plan) of NEI 06-13A
  - Non-licensed Plant Staff Training Program
    - ✓ 18 months prior to scheduled date of initial fuel load
  - Reactor Operator Training Program
    - ✓ 18 months prior to scheduled date of initial fuel load

13.2 Training
Training Programs
Hiring and Training Schedule of Plant Staff



13.3 EMERGENCY PLANNING

13.3 Emergency Planning
Emergency Planning

- Emergency Planning
  - A comprehensive Emergency Plan is provided in COLA Part 5, Emergency Plan.
  - Emergency Plan, Revision 8, for CC3 was issued April 30, 2013.
  - Emergency Plan incorporates new EP Rule Hostile action requirements.
  - NEI 10-05 for staffing analysis has been addressed.
  - NUREG 0654\FEMA Rep-1 requirements have been incorporated.

Chapter 13
Conduct of Operations
Summary

- Twelve (12) COL Information Items, as specified by U.S. EPR FSAR, are addressed in Calvert Cliffs Unit 3 FSAR Chapter 13
- No ASLB Contentions
- No Departures/Exemptions from the U.S. EPR FSAR Chapter 13
- Six (6) SER Open Items
- All RAI responses have been submitted

14.3 INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA

(ITAAC)

Verification Programs
Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)

- ITAAC sets (Total: 1521) consist of:
  - Design Certification ITAAC (DC-ITAAC) (1275)
  - COLA ITAAC (246)
    - Site Specific system ITAAC (SS-ITAAC)
    - Emergency Planning ITAAC (EP-ITAAC)
    - Physical Security ITAAC (PS-ITAAC)

Chapter 14
Verification Programs
Summary

- Sixteen (16) COL Information Items, as specified by U.S. EPR FSAR, are addressed in Calvert Cliffs Unit 3 FSAR Chapter 14
- No ASLB Contentions
- No Departures and no Exemptions from the U.S. EPR FSAR
- Thirty-seven (37) SER Open Items
- All RAI responses have been submitted

CONCLUSIONS

Chapters 2.4, 2.5, 3, 9, 13 and 14
Conclusions

- No ASLB Contentions
- There are seven (7) departures and four (4) exemptions.
- Responses have been submitted to 92 of the 93 SER Open Items.
- As of December 05, 2013, eighteen (18) of the nineteen (19) Chapters of the Calvert Cliffs Unit 3 FSAR have completed Phase 3 (all but Chapter 1, which does not require ACRS review).

Acronyms

- ACRS – Advisory Committee on Reactor Safeguards
- ASLB – Atomic Safety & Licensing Board
- CCNPP – Calvert Cliffs Nuclear Power Plant
- CSDRS – Certified Seismic Design Response Spectra
- CEUS – Central and Eastern United States
- COL – Combined License
- COLA – COL Application
- CVSZ – Central Virginia Seismic Zone
- CWS – Circulating Water System
- DBA – Design Basis Accident
- EPGB – Emergency Power Generating Building
- ESWB – Essential Service Water Building
- ESWS – Essential Service Water System
- FSAR – Final Safety Analysis Report
- GDC – General Design Criterion
- GMC – ground motion characterization
- HVAC – Heating Ventilation & Air Conditioning
- IBR – Incorporate by Reference
- ITAAC – Inspections, Tests, Analyses, and Acceptance Criteria
- MCR – Main Control Room
- MVE– Mineral Virginia Earthquake
- MWIS – Makeup Water Intake Structure
- NI – Nuclear Island
- NPSH – Net Positive Suction Head
- NWS – National Weather Service
- PMH – Probable Maximum Hurricane
- PMSS – Probable Maximum Storm Surge
- PMT – Probable Maximum Tsunami
- PSHA – Probabilistic Seismic Hazard Assessment
- RAI – Request for Additional Information
- RCOLA – Reference COL Application
- SB – Safeguards Building
- SER – Safety Evaluation Report
- SLOSH – Sea, Lake, and Overland Surges from Hurricanes
- SPH – Standard Project Hurricane
- SSC – seismic source characterization
- SSCs – Structures, Systems and Components
- SSE – Safe Shutdown Earthquake
- SSI – soil structure interaction
- UHS – Ultimate Heat Sink

US-APWR
Design Certification Application

Chapters 6 and 7
Topical Report supporting Chapter 6
LTCC / GSI-191

ACRS Full Committee Presentation

December 5, 2013

Mitsubishi Heavy Industries, Ltd.

Presenters

- **Ryan Sprengel**
  - ✓ DCD Licensing Manager
- **Rebecca Steinman**
  - ✓ DCD Licensing Engineer, Ch 6
- **Erin Wisler**
  - ✓ DCD Licensing Engineer, Ch 7

Introduction

- **Previous ACRS Full Committee meetings**
  - ✓ September 9, 2011 – Chapters covered: 2, 5, 8, 10, 11, 12, 13, 16
  - ✓ September 6, 2012 – Chapter 9 covered
  - ✓ April 11, 2013 – Chapters 4, 15, 17, 19; Topical Reports supporting Chapters 4 and 15, respectively
- **Significant upcoming submittals**
  - ✓ Ch 6 MUAP-07031 Rev. 2 to be submitted, Dec 2013
  - ✓ Ch 7 MUAP-07005 Rev. 9 to be submitted, Dec 2013
  - ✓ Ch 15 LB and SB LOCA topical reports revisions submitted, Dec 2013
- **Adjustment of ongoing US-APWR DC Activities**
  - ✓ Letter (UAP-HF-13256) submitted to NRC 11/5/2013
  - ✓ Coordinated slowdown of DCD Licensing Activities, while maintaining a commitment to US-APWR

Chapter 6 – Engineered Safety Features

- **ACRS Subcommittee meeting held September 17, 2013**
- **Remaining SE Open Items**
  - ✓ Items in which MHI submitted response that is awaiting staff review / confirmation of closure
    - Sparger hydrodynamic loading
    - Design change impact on M&E release analysis under secondary system piping rupture
    - Ch 15 RAIs tied to debris impacts on boron precipitation / LTCC
  - ✓ Other open items have alignment with NRC Staff and closure path is confirmation of changes in DCD Rev. 4
- **Written responses to ACRS SC questions to be submitted, December 2013**
- **No current RAIs**

Chapter 6 – LTCC / GSI-191

- **ACRS Subcommittee meeting held October 1, 2013**
- **Remaining SE Open Item**
  - ✓ Tier 2* designation of debris amounts
- **Written responses to 12 ACRS questions to be submitted, December 2013**
- **No current RAIs**

Chapter 6 – Topical Report

➢ MUAP-07001, The Advanced Accumulator

- ✓ ACRS Subcommittee meeting held September 18, 2013
- ✓ Staff issued public version of advance TRSE on 11/14/13
- ✓ MHI submitted ACC scaling revisions to the LB LOCA (MUAP-07011) 12/4/13 and SB LOCA (MUAP-07013) topical reports on 12/5/13

Chapter 7 – Digital I&C

- **ACRS Subcommittee meeting held April 2013**
  - ✓ 14 questions requiring follow-up
  - ✓ Subsequent discussions held with Staff
- **Written responses to 14 ACRS questions submitted September 2013**
- **RAI responses corresponding to SE Open Items submitted and under Staff review**
  - ✓ Common cause failure, D3 coping analysis, post accident monitoring variables, and others
- **No current RAIs requiring MHI response**

Presentation to the ACRS Full Committee – 610th Meeting

United States – Advanced Pressurized Water Reactor (US-APWR) Design Certification

Safety Evaluation Report with Open Items
for
Chapters 6 & 7

Safety Evaluation Report
for
Advanced Accumulator Topical Report

Perry Buckberg
US-APWR Design Certification Lead Project Manager

December 5, 2013

US-APWR Design Certification Review Schedule

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

	COMPLETION DATE
Phase 1 – Preliminary Safety Evaluation Report (SER)	Completed
Phase 2 – SER with Open Items	May 2014
Phase 3 – ACRS Review of SER with Open Items	August 2014
Phase 4 – Advanced SER with No Open Items	February 2015
Phase 5 – ACRS Review of Advanced SER with No Open Items	April 2015
Phase 6 – Final SER with No Open Items	September 2015
Rulemaking	February 2016

Summary of the US-APWR Safety Evaluation Reports

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

- The staff has issued Safety Evaluation Reports (SERs) with Open Items for Chapters 2, 3 (partial), 4, 5, 6, 7, 8, 9, 10, 11 ,12 13, 15, 16, 17 and 19 (partial).
- Of the issued chapters, all but Chapter 3 (partial) have been presented to the ACRS Full Committee.
- The staff has also issued SERs for five US-APWR Topical Reports.

US-APWR Chapter 6 Engineered Safety Systems

U.S.NRC
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- The SE for Chapter 6 addresses the engineered safety systems, engineered safety feature material, containment systems, emergency core cooling systems, habitability systems, fission product removal control systems, inservice inspection (ISI) of Class 2 and Class 3 components
- The following Chapter 6 Open Items were discussed during the September SC Meeting
  - **Open Item RAI 923-6420, Question 06.02.01-21:** Containment Internal Design Changes in the DCD
  - **Open Item RAI 1036-7079, Question 06.02.02-94:** Tube-side and Shell-side Fouling Factors Used for the CS/RHR HX Design
  - **Open Item RAI 597-4590, Question 06.03-85:** SI and RHR/CS Pump Testing
  - **Open Item RAI 881-6203, Question 06.03-104:** ITAAC for SI and RHR/CS Pump Testing

US-APWR Chapter 6 Engineered Safety Systems

U.S.NRC
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- Open Items continued:
  - **Open Item RAI 391-2974, Question 06.03-35:** Lack of an Advance Accumulator Small Injection Flow Rate ITAAC
  - **Open Item RAI 982-6036, Question 06.03-111:** Emergency Letdown Sparger Design
  - **Open Item RAI 559-4387, Question 06.04-11:** Flood Barriers
  - **Open Item RAI 927-6460, Question 06.04-16:** Condensate equipment drain lines
  - **Open Item RAI 955-6585, Question 06.04-17:** Refrigerant Leak
- There were no staff action items from the September Subcommittee meeting related to Chapter 6.

US-APWR Advanced Accumulator Topical Report

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

- The following ACC Subjects were discussed during the September SC Meeting
  - Overview of Advanced Accumulator Design
    - Principle of Advanced Accumulator
    - ACC role in ECCS performance during LOCAs
  - ACC Scaled Testing/ Test Results Summary
  - ACC Characteristic Equations
  - Applicability of ACC Characteristic Equations
  - Uncertainty Evaluation and Treatment
  - CFD Scaling Analysis of the Advanced Accumulator
    - Scaling Bias
- There were no staff action items from the September Subcommittee meeting related to the AAC.

US-APWR Long Term Core Cooling

U.S.NRC
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Protecting People and the Environment

- The following LTCC Subjects were discussed during the October SC Meeting
  - GSI-191 Evaluation for Sump Performance
    - Break Selection
    - Debris Generation/Zone of Influence (ZOI)
    - Latent Debris
    - Debris Transport
    - Chemical Effects
    - Debris Source Term Control
  - Strainer Head Loss Evaluation
  - Ex-Vessel Downstream Effects

US-APWR Long Term Core Cooling

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- In-Vessel Downstream Effects
  - Debris Bypass
  - Core Blockage Acceptance Criteria
  - Fuel Bundle Head Loss Testing
  - Debris Deposition Analysis
- Structural Design of Strainer/Debris Interceptors
- Net Positive Suction Head (NPSH)

- The following Chapter 6 Open Items related to LTCC were discussed during the October SC Meeting
  - **Open Item RAI 840-6096**
  - **Open Item RAI 997-7033**
  - **Open Item RAI 719-5352**
- There were no staff action items from the October Subcommittee meeting related to the LTCC.

US-APWR Chapter 7 Instrumentation and Controls

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- Chapter 7 addresses the reactor trip system, engineered safety feature systems, analyses of the plant's responses to postulated disturbances and postulated equipment failures or malfunctions.
- The open items discussed during the April Subcommittee meeting are as follows:
  - **Open Item RAI 568-4588 -** Selection criteria for PAM variables should be refined (7.5)
  - **Open Item RAI 753-5742 & Follow-up RAI 988-7021 -** Basis for the inputs and assumptions used in D3 Coping Analysis (7.8)
  - **Open Item RAI 992-6999** - Sufficient evidence to demonstrate that the use of O-VDUs enhance the performance of the safety system ITAAC that adequately verifies testing for normal and abnormal data transmission conditions for all non-safety to safety interfaces (7.9)

US-APWR Chapter 7 Instrumentation and Controls

U.S.NRC
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- Open Items continued:
  - **Open Item RAI 995-7024 -** Process to flow down the requirements for MELTAC platform hardware/software components (7.1)
  - **Open Item RAI 993-7027 -** Process to ensure vendor's safety software development process (7.1)
  - **Open Item RAI 996-7040 -** How the plant would be adequately protected from each PCMS failure, including single failures and design defects. (7.7)
- ACRS SC Meeting Actions
  - MHI submitted written responses in September to 14 Subcommittee questions after discussions with the NRC Staff.
  - Two additional items will require NRC staff to update the SE.